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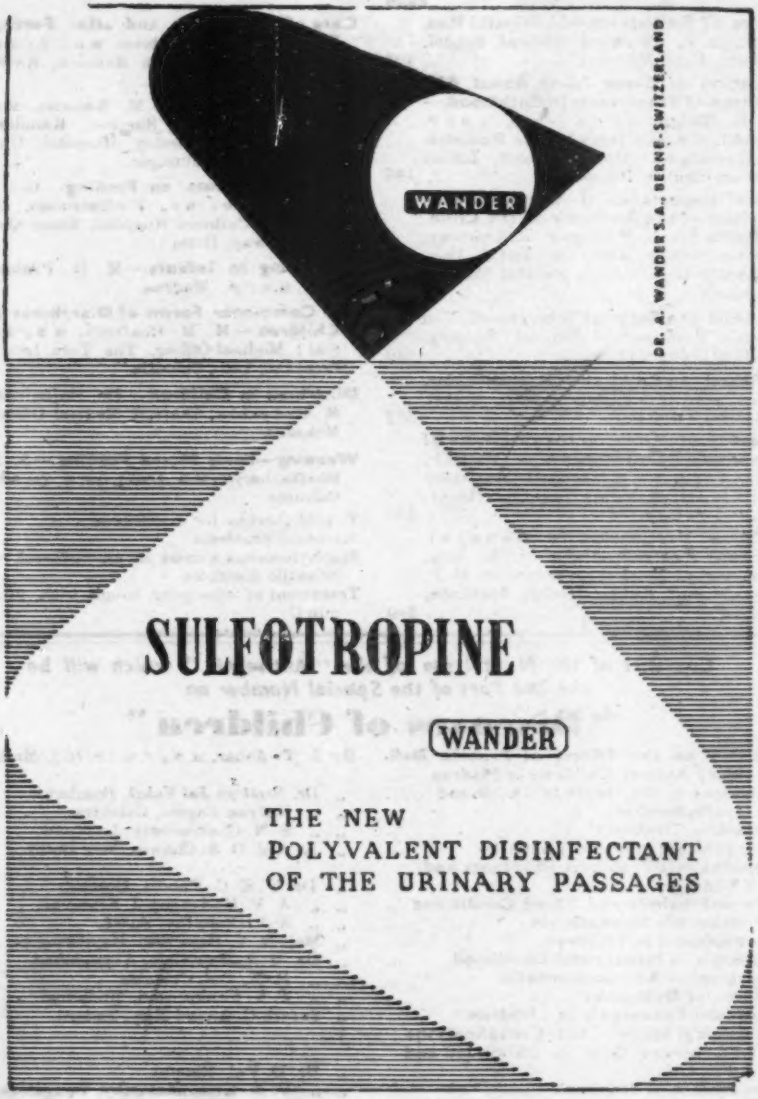

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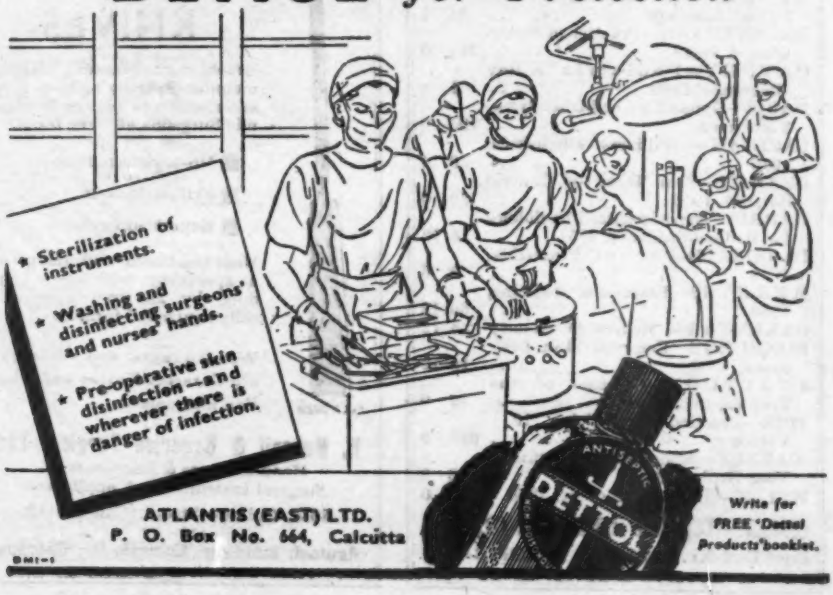
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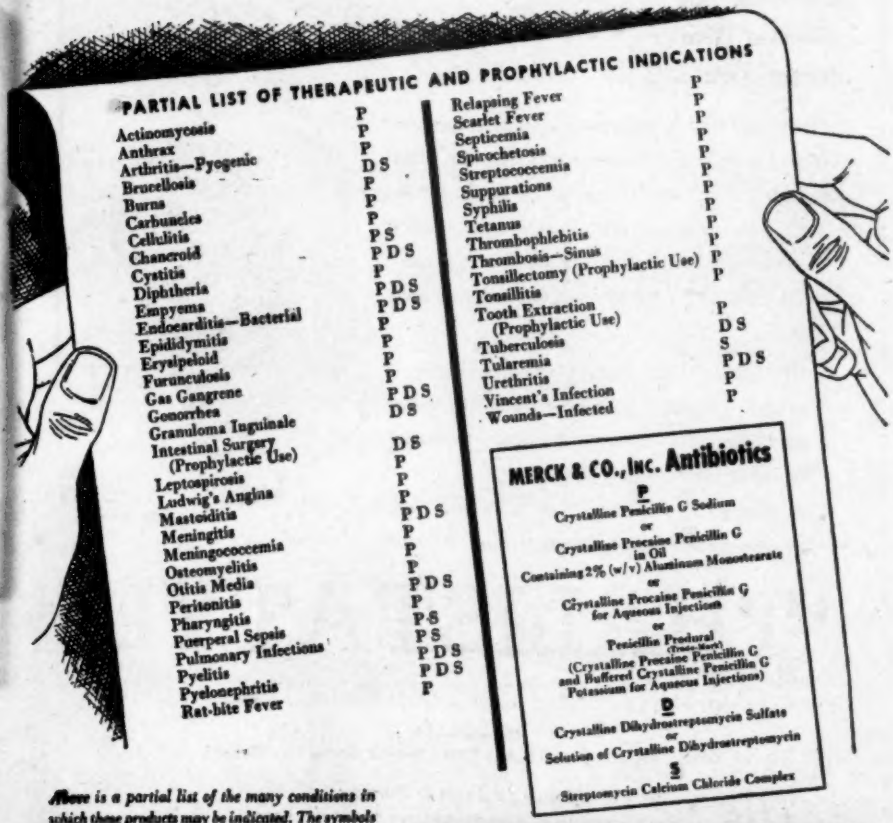

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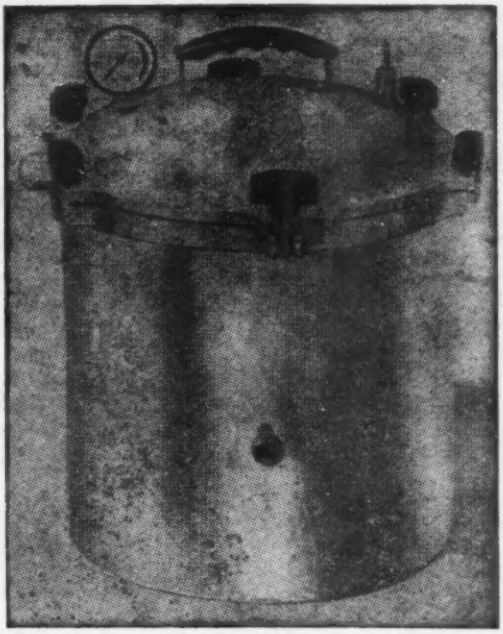

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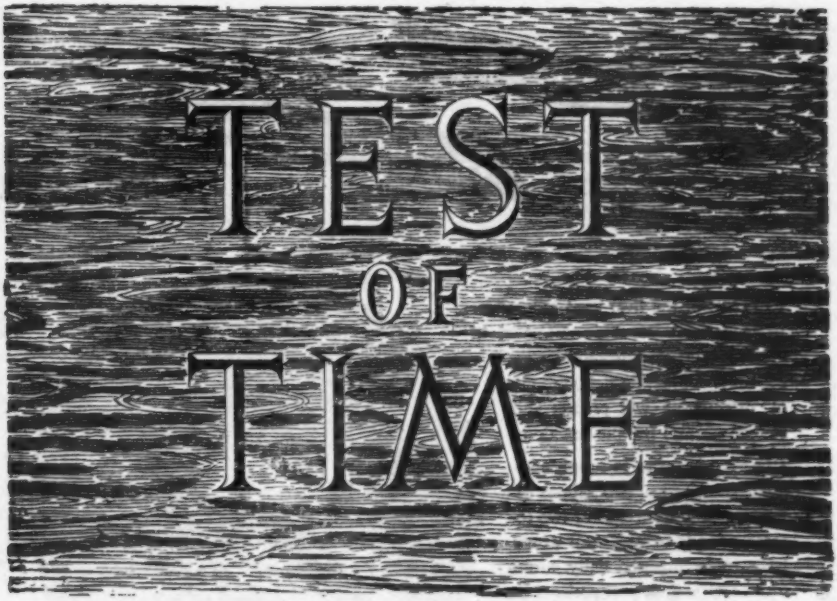

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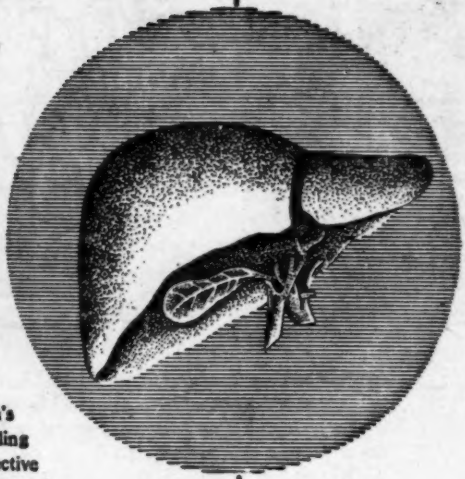

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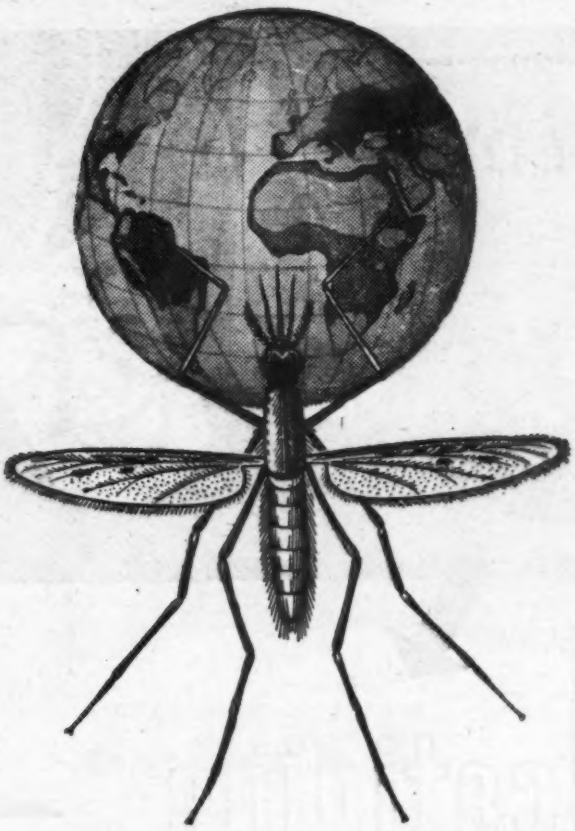

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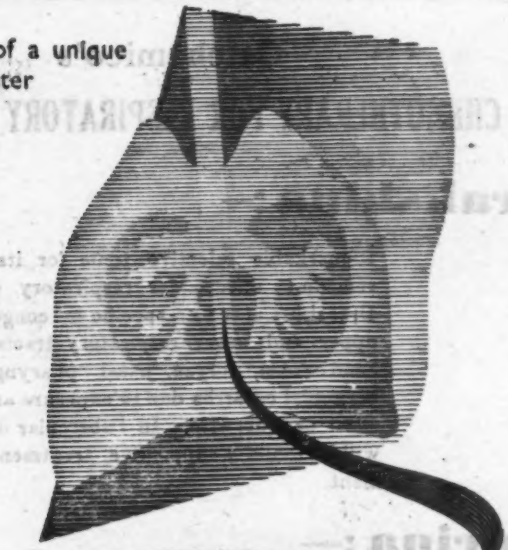

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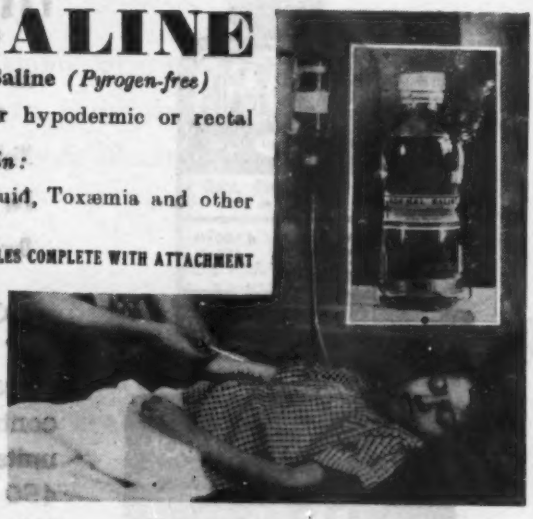

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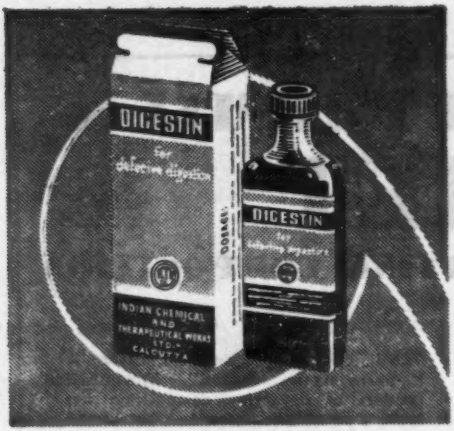

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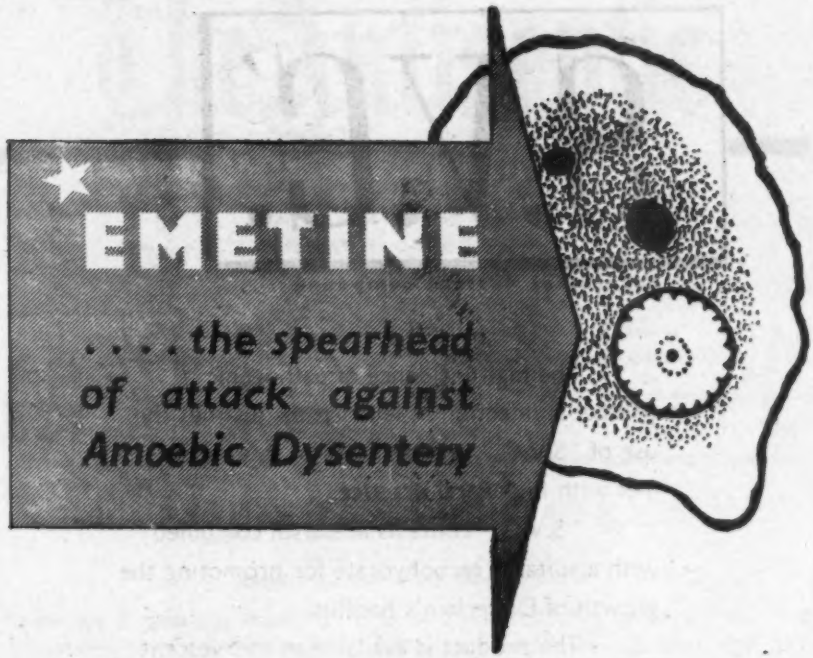

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Special Number on "Diseases of Children"—Part I

The Antiseptic

Estd. 1904

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ESSENCE OF PÆDIATRICS

U. SRIPATHI RAU, M.B., B.S.,

Harvard Medical School, Boston, U.S.A.

BEFORE I give the essence of pædiatrics, which I hope will be very useful to the General Practitioner, I wish to mention our great need at present. Our wants in this world are many but our dire needs are few. One of these needs in Madras is a good Children's Hospital—an hospital enough to cater to the needs of the unfortunate ill children. After visiting the various children's centres and hospitals in the United States of America and Canada, I feel that a Pædiatric Ward in the General Hospital is inadequate to serve the big population of children in Madras. We require not a ward or wards but hospitals—a few at least in the city with adequate and qualified staff. This is an ideal but at present it is difficult to achieve. The next best is to have adequate pædiatric blocks or wings attached to General Hospitals of the city, utilizing all their facilities like Radiology, Pathology, Surgery, E.N.T. etc. If this is so any problem regarding children can be tackled successfully. Great pains must be taken to prevent any cross infection in the general wards by segregating the patients in cubicles. Younger they are, the greater the care that should be taken, and in some cases individual isolation must be done. Surgery in pædiatrics is a specialized subject and our surgeons of the city can tackle them easily with a little practice. Cardiac surgery may be attempted more often by our surgeons with advantage and many cases of congenital lesions like patent ductus arteriosus and congenital anomalies of the great vessels can be tackled and thereby the child can be benefited and its life prolonged. The hospital can also give valuable advice to mothers regarding feeding problems.

The second important need is a Well-Baby Clinic where the normal children are examined every now and then and the mother advised regarding the normal food requirements and the normal development of the child. To these clinics, as differentiated from the hospitals, normal babies are brought in and with them the mothers also attend. A few lectures by competent people and nurses are given for the benefit of these mothers. Mothers can discuss their problems freely with the doctor-in-charge and take proper advice regarding the upbringing of their children. To give such an advice the doctor should know the proper development and growth of the normal child and the variations in health and disease and I think the following points would be profitable. They are taken from the growth and development chart of the Toronto (Canada) Baby with a few alterations according to our children's standards.

Growth and development.—*Weight*:—The birth weight of the child is $6\frac{1}{2}$ pounds and it loses about 9 ounces during the first three days of its life but regains its birth weight rapidly within the first ten to fifteen days. The weight is doubled (13–14 pounds) in six months and trebled (20 pounds) in one year. In five years the weight is 40 pounds. During illness the gain in weight either retards, ceases or there is a loss out of proportion to the severity of the illness. Birth weight may be above or below the average and may remain above or below the average throughout the first year.

Height:—The length of the child at birth is about 20 inches and there is a rapid gain during the first year of life, about 9 inches, and slower during the second year, about $3^1/_2$ inches, and thereafter $2^1/_2$ inches per year. Irregularities in height are mostly due to heredity and rickets. At birth the extremities as compared to the trunk are shorter (43%) but at five years the extremities are longer than the trunk (54% of the length of the body). Effect of malnutrition upon the length of the body is much less than on the weight.

Chest:—Circumference: Birth 13 inches, 6 months 16 inches, 1 year–$1^1/_2$ years 18", and in 5 years 21". At birth the transverse and anterior-posterior diameters are the same but as age advances the transverse diameter increases much more rapidly. The circumference of the chest is $^1/_2$ an inch less than that of the head but at the 3rd year both are the same and after that age the circumference of the chest exceeds the head.

Head:—Birth 13", 6 months 16", 1 year 18", 3rd year 19", and in the 7th year the circumference is 20".

The sutures normally close by six months but abnormal wide separation is found in premature children and in those having congenital syphilis. In some there is early closure and ossification even before birth which give rise to microcephalics.

The fontanels close; anterior 14 to 22 months and posterior 2nd month. Anterior fontanelle is 1" in diameter at the end of the 1st year.

Shape of the head: (*a*) Compression from labour (disappears within 1 month); (*b*) brachycephalic; (*c*) dolichocephalic; (*d*) irregularities:—rickets, hydrocephalus, premature ossification and brain malformations.

Abdomen:—Circumference at umbilicus: throughout infancy same as the chest but less than the head. End of 2nd year: same as the chest and the head. After the 2nd year: chest increases much more rapidly.

Unusual enlargements:—(*a*) Chronic intestinal disorders; (*b*) tympanitis (rickets); (*c*) enlargement of abdominal organs: (i) acute; (ii) chronic (malaria, kala-azar, infantile biliary cirrhosis); and (*d*) new growths like Wilm's tumour.

Stomach:—Capacity: Birth 1·20 oz.; 2nd week 1·50 oz.; 4th week 2·00 oz.; 8th week 3·30 oz.; 12th week 4·50 oz.; 6th month 5·75 oz.; and 12th month 8·90 oz.

SPECIAL SENSES.—*Sight*:—Infants avoid light during the first few weeks after birth. Cornea slightly sensitive in the newborn. Eyes follow light by the 6th day, co-ordinate by the 3rd month and recognize objects by the 6th month.

Hearing:—Deaf the first 24 hours, becomes acute at the end of 5–7 days, tries to turn the head towards sound by 2–3 months and recognizes familiar voices by 3–4 months.

Touch:—Not highly developed except lips and tongue at birth. It is acute all over the body at the 3rd month and localization of sense impressions start by the 5th month. Temperature sense is developed early.

Taste:—Highly developed at birth.

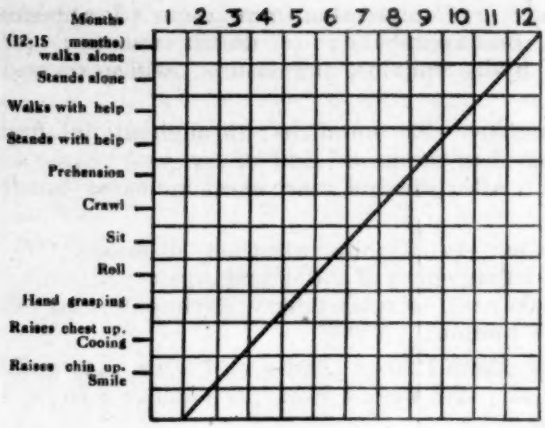
Smell:—Developed later than other senses.

Speech:—Time of development varies greatly. Girls talk from 2 to 4 months earlier than boys. Towards the end of the first year single words like '*papa*' '*mama*' etc. and after the 1st year sentences of 2 to 3 words are spoken and thereafter there is a rapid improvement. The order of development in the second year is as follows:—Names of persons and objects, verbs, adverbs, adjectives, conjunctions, prepositions and personal pronouns. Delay in speech development (if after two years) may be due to the defects in the central nervous system, peripheral nervous system, organs of phonation, or in the organs of articulation.

Muscle development (*greatly varies*):—Developmental chart (*vide chart, page 496*) first year (from Harvard Medical School).

Abnormal delay in appearance of functions is due to: (1) Malnutrition; (2) prolonged illness, (3) injuries to the nervous system; and (4) rickets.

Deformities of the bony system are due to: (*a*) Rickets (chiefly); (*b*) empyema; (*c*) emphysema; (*d*) cardiac diseases; (*e*) scoliosis;



(*f*) Pott's disease; and (*g*) chondrodystrophies.

TEETH :—Deciduous or milk teeth 20 in number. 2 lower incisors 6–9 months; 4 upper incisors 8-12 months; 2 lower lateral incisors 12–15 months; 4 anterior molars 12–15 months; 4 canines 18–24 months; and 4 posterior molars 24–30 months.

A child should have at the end of the first year 6 teeth; $1^1/_2$ years 12 teeth; 2 years 16 teeth; $2^1/_2$ years 20 teeth.

Variations :—(*a*) A child may be born with teeth; (*b*) teeth may appear as early as the 4th month; (*c*) nursing children get teeth earlier than artificially fed children; (*d*) syphilitic children are prone to early dentition; (*e*) irregularities in the order of appearance of teeth are found in idiotic children; (*f*) delayed dentition occurs: (i) healthy children (10 months); (ii) rickets; (iii) cretinism; and (iv) malnutrition.

Permanent teeth :—1st molar 6th year; incisors 7–8 years; bicuspids 9–10 years; canines 12–14 years; 2nd molars 12–15 years; and 3rd molars 17–25 years.

The problems are many for the mothers but the most important one is the feeding problem. Such a problem can be tackled by the doctor-in-charge of a Well-Baby clinic. In case of breast-fed babies, the problems are very few, for the breast milk contains all the essentials. The only addition to the breast feeds would be vitamins C in the form of orange juice and vitamin D in the form of cod-liver-oil. The trouble comes only when the child is on artificial milk feeds. The mothers do not know what, when and how to give the artificial feeds. Overfeeding in this country is a rarity due mostly to poverty but underfeeding is the commonest problem not only in the poorer classes of society but also in the well-to-do people due to ignorance and wrong advice. The artificial feeds are calculated according to the expected weight of the child.

Five fundamental principles are to be kept in mind in infant feeding :—

(1) Energy requirement; (2) protein requirement; (3) inorganic salts; (4) vitamin requirement; and (5) fluid requirement.

Energy required by the child is 50 calories per pound of body weight if the child is below 6 months and 45 calories per pound if

aged above 6 months, per day. This caloric requirement is supplied by milk with the addition of carbohydrates in the form of sugar. One ounce of sugar can safely be given to a child below 6 months or 15 pounds in weight and 1½ ounces to the child above that age or weight. One ounce of sugar yields 120 calories and one ounce of milk 20 calories.

Protein requirements are very well covered in 1½ ounces of milk per pound of expected body weight supplied to the child. A normal child gets more than 1½ ounces of milk per pound body weight if correctly calculated and fed, and so the protein need of the child is very well covered.

Most of the inorganic salts which are essential to the human body are found in cow's milk except Iodine and Iron. In areas containing water with deficient iodine content, iodized salts must be added to the feeds. Often infants too long on milk alone (breast or bottle) get milk anæmia and so iron must be given now and then in the form of ferrous salts.

Majority of the vitamins are found in milk with the exception of vitamins C and D. Half an ounce of orange juice and a teaspoonful of cod liver oil daily would easily supplement the vitamin deficiency.

Fluid requirement of the body is great in a child when compared to that of an adult. The child requires 3 ounces of fluids per pound of body weight per day. If the child is above 10 pounds the maximum fluid requirement is 40 ounces a day.

To sum up, a 10 pound baby's diet with milk can be calculated as follows :—

Energy required 50 calories/pound or 50 x 10=500 calories.

Carbohydrate required : 1 ounce yields 120 calories.

The remaining caloric needs are made up by milk to be given (one ounce yields 20 calories) 380 calories or 19 ounces of milk.

Fluid required is 3 ounces per pound of body weight and so the fluid required is 30 ounces.

So the milk ratio must be : Milk 19 ounces ; water 11 ounces ; sugar 1 ounce. The total quantity should be divided into six feeds and given once in 3 hours.

An ounce of orange juice and a teaspoonful of cod liver oil is all that is needed in addition.

The common practice of giving gripe water as a daily routine and frequent purgatives is not only not necessary but harmful. There are very many feeding problems but space does not permit their elucidation. All the problems must be very familiar to the clinician in charge of a Well-Baby Clinic.

In addition, the Well-Baby Clinic should deal with minor psychological problems such as bed wetting, thumb sucking, tempertrantrums, habit spasms and masturbation. These clinics should

carry out prophylactic inoculations against diphtheria, whooping cough and tetanus in the form of triple vaccine.

The most important therapy in pædiatric practice is the " fluid therapy ". The fluid requirement of the child, as we have seen just now, is very much more than that of the adult and the children are apt to lose this fluid very easily by vomiting and diarrhœa. They not only become dehydrated quickly but go in for acidosis and later coma. I have given below a few of the important fluids used in pædiatrics in a chart form :

Parenteral fluid therapy

Fluids	Conditions requiring fluid therapy	Amount and routes
2 parts of 5% Glucose and one part of Normal Saline.	Dehydration, acidosis, shock, pyloric stenosis.	Subcutaneous 10 c.c. per pound of body weight. Intravenous 2 oz. per pound per day.
Lactate solution ..	Acidosis.	Same as above.
Darrow's solution— Pot. Chloride 2 g Sod. Chloride 3 g Molar Sod. Lactate 40 c.c. Water 710 c.c.	In severe cases of acidosis designed for intracellar repair for replacing potasium loss.	I.V. 10–30 c.c. per pounds of body weight for 3 days. S.C. Oral.
Proteins— Nutramigen. Amegen. (Mead Johnson)	Protein deficiency Anasarca	Oral. I.V. 1·5–10% soln. 1–2 g per kilo weight.
Blood and plasma.	Hæmorrhage Nutritional œdema.	I.V. 20 c.c. per pound of body weight.

Polyethylene tubing can be conveniently used for I.V. continuous fluid transfusion. They are flexible and the movement of the limbs do not disturb the tubing.

During my stay in Canada, I was very much impressed by the camp life for the chronically ill children. It is a camp situated a few miles from the busy city where these children spend a month each year. In that camp the children are taught, fed and looked after very carefully. For example, a diabetic child is taught to weigh the foodstuff according to its needs, to take insulin itself and to feel that he is not the only one who is the sufferer from diabetes when he sees his brethren with the same disease. The patients suffering from chronic cardiac lesions, bronchiectasis and other chronic diseases attend these camps. Convalescent camps on these lines for children with ailments which require prolonged care, will go a long way to rehabilitate these children as well as relieve the congestion in the overcrowded hospitals in the city, making room for acute cases.

The last but not the least of all the needs is a Pædiatric Association in Madras and a Pædiatric Journal.

EVALUATION OF SOME IDEAS ABOUT AILMENTS AND TREATMENTS IN CHILDHOOD

M. K. GADGIL, M.R.C.S. (Eng.), L.R.C.P. (Lond.), M.B.,B.S. (Bom.),
Late Paediatrician, Sassoon Hospital and Infant Welfare Centre, Poona.

IDEAS about ailments and their treatments are undergoing radical changes with the advance in knowledge.

Erroneous ideas about ailments in children are rampant all over; the illiterates still associate the occurrence of some diseases with the rath of deities, while educated men get bewildered when they hear the scientist and compare these views with those that are fixed in their minds for years.

The good old granny still forms the first line of defence to any upset in the child, her long experience about ailments in children and their household remedies handed down to her from generation to generation is not a negligible proposition.

We find that the scientist of yesterday was erring in the understanding of certain diseases and the scientist of tomorrow is similarly bound to discover that we also made mistakes.

Some practitioners and the intelligentsia carry erroneous ideas about ailments in children and it is the object to take into account some of these ideas and compare them with the findings of the writer.

The principles of infant and child-feeding are grasped by few, in fact every mother should be conversant with them. One feels surprised when an educated mother says that the cause of the diarrhœa or vomiting or dyspepsia in her child is because her milk has gone bad and does not agree with her child; on occasions it is observed that a medical practitioner has given her this idea. At times her diet is blamed for the trouble in her breast-fed infant. Some mothers confidently state that the child gets upsets when she eats a certain article of diet. I have made experiments by asking them to eat the alleged offending article of diet to their hearts' content and proved to them that their fears were groundless.

Breasts are perhaps one of the best filters Nature has provided; the cause of the complaint in the child is found to be somewhere else; and woe befalls the small infant, if it is advised to be weaned.

Few natural developments in the human body have come to be so much blamed as teething in childhood. In the case of a number of ailments, particularly those referable to the gastro-intestinal tract and the nervous system, the erupting tooth is pointed out to be the culprit, not only by the laity but also by many a practitioner. Even the authorities are ambiguous, whether or not dentition causes

any ailments in children and express views which err on the safe side. Some tooth is always in the process of erupting from about nine months to two years. Why should then a child fall ill when a certain tooth is coming out and not when the other was showing out. I have practically always found a cause for an ailment somewhere else when teething was blamed, and consider that teething does not cause any ailment in children. It is interesting to note that no one points out to the tooth when ailments occur during the second dentition.

Similarly worms have come to be more blamed than they deserve. Troubles like diarrhœa, vomiting, dyspepsia, irritability, convulsions, teeth-grinding and a host of others are said to be due to worms. It is true that many children, particularly the run-down and dirty, harbour round worms in their intestines; but when they are few, they are harmless; and it is a usual finding that after the bowels are freed of them by an anthelmentic the trouble complained of continues, and it is observed that the roots of the trouble were somewhere else.

This is not so in the case of the thread-worms, which generally infest in large numbers and cause much harm to the child by their nefarious activities. Many helminths are capable of much mischief but they are not so common and some have territorial importance. It is important to grasp in this connection that it is not generally the worms that cause dyspepsia and wasting to begin with, but a marasmic dyspeptic child forms a good soil for the lodgement and propagation of the worms, and the vicious circle continues.

Far too many diarrhœas and vomiting are treated by drugs alone. Drugs hold a second place in their treatment; stoppage of all food and the treatment of dehydration which accompanies it, is of paramount importance. The mortality from diarrhœas and vomiting will be greatly reduced if efficient treatment is forestalled for dehydration that ensues; treatment which follows is bound to be less successful.

It is not only in diarrhœas and vomiting that dehydration occurs; the rapid breathing which takes place in infections of lung tissue, causes marked dehydration; fluid is lost to a very great extent in the breath. In acute illnesses with high temperatures, in convulsions and persistant crying, dehydration ensues. This factor is far too important in hot countries and in hot weather; and the smaller the infant the more frequently and seriously he is affected. The adult tissues get fibrous with advancing age, but the tissues of the child are far too cellular, requiring fluid for their efficient functioning and the infant like a seedling will not stand deprivation of fluid for any length of time. The giving of water or glucose-water alone will not suffice to combat dehydration, the required electrolyte has got to be supplied in sufficient quantities.

Convulsions in childhood particularly amongst infants is another ailment where there is much misunderstanding. Tetany is responsible for a vast number of convulsions in infants. On occasions an infection, or a fall, or some such exciting factor has pulled the trigger and let loose the convulsions, but the stage was already set, and it would have been found that the infant did not have sufficient Calcium concentration in his blood.

Worms, teething, phymosis are amongst the popular causes which are blamed for starting convulsions, but they are hardly ever the cause.

The child is quite happy with his few round worms, teething go their way quite innocent, and phymosis, unless of such a degree to cause back pressure and toxæmia (which is rarely met with in general practice), is hardly ever the cause.

It would be fortunate for many infants, if the phimosed prepuce which they carry would not have lent itself to such an easy attack by an enthusiastic surgeon. Misfortune has befallen an infant if circumcision is performed with the idea of curing his fits; after the operation they are let loose with a vengeance, and at times misfortunes do not come singly, for hæmorrhage and sepsis occur at the site.

Morphia and hypnotics pushed to the limit of just not abolishing the sucking reflex and administration of sufficient quantities of Calcium after inducing the acidemia is the proper treatment. Giving of Calcium Lactate powders alone or injections of Calcium is of no avail.

The subject of enlargement of liver in childhood has caught popular fancy. The laity has learnt something about the dreadful incurable disease called cirrhosis of liver in children. They consider that the disease has set in, whenever they learn that the liver of the child has enlarged. Advantage is taken of this terror for the disease by unscrupulous vendors of patent medicines to reap a rich harvest.

It is a very difficult problem when to call that the enlarged liver has taken up the cirrhotic process. To come across a moderately enlarged liver is a common finding; it is due to a vast majority of cases to causes other than cirrhosis. The anæmias, congenital syphilis, heart disease and some other rare diseases cause the liver to enlarge. But then there is a case off and on where the hardness of the liver, taken in consideration with other signs and symptoms and the general condition of the child, leaves little doubt. But then there are some border line cases where time will have to pass before one can give an opinion. At times a practitioner makes a mistaken diagnosis and is responsible for much misery.

Even some of the uneducated have become conversant with the name rickets; they think it is a bad disease which occurs in

children, causes them to waste and kills them. This knowledge they have many times derived from medical men who have not correctly understood the disease. The fancy of the medical student is caught by pictures of the spectacular appearance this disease produces and they get branded in their memory.

The wasted marasmic child is many times diagnosed as a case of rickets; but wasting and rickets do not go together. Rickets is a disease of growth and when wasting begins the rickety processes abate and the case becomes one of infantile atrophy.

One rarely comes across in India a rickety child who shows the bending of his skeleton to the extent of the published pictures of the disease in its severity; here, in India, the Sun is merciful, but the rickety deformity of the chest resulting in falling of the chest-wall and in consequence causing the abdomen to protrude is a very common sight indeed. Particularly hit by this misfortune are children of the poor and the middle classes who are fed entirely on a carbohydrate diet after they are weaned; milk is not available to them and no fats or vitamin D go in their diet; they suffer from carbohydrate dyspepsia, and this gives rise to fermentation and protrusion of the abdomen. The child now looks like a barrel carried on two slender sticks, the wasted legs. Had not these unfortunate urchins been playing in the compassionate rays of the Sun, they would have hardly been able to stand and walk.

It is not generally appreciated to the extent it deserves that the bending of the limbs in rickets is comparatively less harmful than the collapse of the chest-wall and pelvis. The former starts and helps keeping up infection in the lungs due to permanent partial compression of lung tissue and hindered respiratory movements and defective ventilation.

Rickets is not a disease which kills, it is one which softens, softens not only the bones but the muscles, ligaments and practically the entire organism; and death, if it results, is due to the effects of this softening.

The Vitamin Age is on us, the amount of literature turned out and the amount of advertisements piled on us have smothered us. When it becomes possible for one to come out of this big confusion and give the subject a calm and unbiassed consideration, one feels that the exuberance of the scientist coupled with the self interest of the manufacturers has done much ado about something. Not that avitaminosis does not exist or the vitamins have no place in treatment; admittedly they have unquestionable value and one does come across an occasional case of severe avitaminosis, particularly in the hospital class of patients or see them under famine conditions; but an average child suffers from a moderate degree of avitaminosis when he does so. Anæmic, run-down children with wasted limbs and a bloated abdomen waddling down a lane is a

common sight in an Indian town; these are not generally suffering from avitaminosis of much severity but from malnutrition and carbohydrate dyspepsia. What they need is food sufficient in quality and quantity. Milk, sufficient quantities of proteins and fats derived from animal origin and an iron mixture are what they require, and not heroic treatment by the highly priced vitamin preparations, Liver Extracts and Folic Acid.

It is interesting to note that we do not come across cases of phthysis in children as it occurs in the adults; the characteristic of the disease in the adult is its chronic progressive nature; the affected lung tissue goes through the process of caseation and cavitation; no such thing occurs in the child. Does the young lung tissue possess certain degree of immunity to the germ; or does the germ readily filter out of the lung tissue into the lymphatic system and the blood?

We frequently see cases of tubercular meningitis in children; it appears that the tubercle bacillus has a predilection for the meninges of a child but appears to prefer the lung tissue of the adult.

It is a moot point why children with their indiscriminate habits of eating should not fall an easy prey to the typhoid bacillus.

The child, the younger he is, enjoys a certain degree of immunity from the ravages of this disease; and when it does occur, it shows the mild form and a negligible mortality rate and mostly the infecting organism is found to belong to the paratyphoid group.

Quite a big controversy has raged about the value of enucleation of tonsils. It is agreed on all hands that tonsils which are definitely septic should come out. It is observed that the health of the child improves, he grows rapidly and a number of his complaints are cured after removal of his septic tonsils; but it is observed that far too many tonsils are removed; some take a speculative chance and take tonsils out to cure a complaint, and later come to the conclusion that the tonsils were not offending and would have stayed where they were without causing mischief.

Some of the procedures carried out on children are done in an objectionable way. Of these syringing the ear for otorrhœa and giving of glycerine per rectum for relieving constipation may be mentioned.

Syringing the ear for otorrhœa is not only worthless but may be harmful; cleaning the external auditory canal with cotton wool pencils and insupplation of idoboric powder is the best one can do. Similarly giving of undiluted glycerine with the hard big plastic cannulae of a glycerine syringe to a small child though successful to bring out the results, is a painful procedure and may injure the anus or set up proctitis. The correct way to do it is to dilute a small quantity of glycerine with warm water in a 20 cc. syringe and

give it by means of a rubber catheter attached to the nozzle of the syringe.

Some of the drugs used for children have the quality of being harmless, but of little or no value; while others cause definite harm. Of the former mention may be made of lime and dill waters and of the latter Sodi-Citrus, Alkaline waters, castor oil and spiritous drugs, are some that are worth considering.

Sodi-Citrus and the Alkaline waters are on many occasions given to children who are anæmic and wasted for the relief of their vomiting, diarrhœa and dyspepsia from which they usually suffer. The remedy does more harm than good. The weak and anæmic children suffer from lack of sufficient acid in their stomachs, valuable for gastric digestion and their trouble is traceable to this lack; and administration of these alkaline preparations neutralizes whatever little acid there was and does exactly the opposite of what is required to be done and causes worsening of their complaint.

Regular administration of castor oil for relieving chronic constipation is a mistake committed often by mothers and even by some doctors. The remedy is worse than the disease; though successful immediately, it later causes progressive inveterate constipation resulting in damage to the bowel mucus membrane due to chronic irritation and inflammation by the action of the ricinoleates in the oil.

Similarly infants are observed to be given preparations containing alcohol. Many patent preparations, mixtures from dispensaries made up of wine, tinctures, spirits and Asavas and Arishtas contain alcohol. This goes to the child at times in good quantities and for some length of time. It sets up chronic irritation of the delicate mucus lining of the bowels and gives rise to stimulation and later to depression of the child.

Small bottles of the concentrated vitamin A & D preparations on the market adorn the shelf of many a home. It has of late become a fashion to prescribe these drop preparations for a number of ailments and as a tonic to improve wasted children. They possess the advantage of ease of administration and have a place in the treatment of some ailments in children. But indiscriminate use is made of them, and in many cases they have not served the purpose for which they were intended.

Massaging a child with cod liver oil is very popular; here the act of massaging is of great value and the kind of oil used is of small significance; massaging with cocoanut oil is equally good, if cod liver oil is administered internally, and has the advantages of avoiding the foul smell of cod liver oil.

Advertisements of tonics and drugs for treatment of many illnesses abound in the lay press and on walls of cities and even in villages. Many of them are worthless and a few harmful.

Advantage is taken of by vendors of these preparations of the ignorance of the population to fill in their coffers; it is high time Government stepped in and put a stop to this exploitation of the gullibles.

But that means hoping for the Moon under the present circumstances. The struggle for existence is getting keener, the manufacturers of these patent preparations are systematically training the public to drug themselves, and with vast resources at their command and no code of ethics to follow, it will be very difficult for practitioners to compete with them, and the day is not distant when the doctor will be driven to the wall and be one of the screws of this vast machinery. The short-sighted practitioner helps in the disintegration of himself and his brothers by falling a prey to the request of the patients to prescribe a patent. It is time that the teachers of medicine point out the danger to the budding doctor.

I have given consideration to a few ideas prevalent in Western India about ailments and treatments in children and have evaluated them in the light of my experience of children for two decades. I have not concentrated on an occassional case which may tell a different tale, but on the vast majority of Indian children. It is possible that some of the views I have expressed may be erroneous and it is not unlikely that I may modify some later with further experience in this field.

Toxoid Therapy for Diphtheria

The use of diphtheria toxoid instead of or in combination with antitoxin is definitely a new therapeutic procedure. This method is based on the following idea: The body cells may accept either toxin or toxoid. Toxin is dangerous; toxoid is not. If it would be possible to bring the toxoid to the body cells before the cells are reached by the toxin, the cells might be blocked against the toxin and thus be protected. To achieve this blockade the toxoid was given intravenously daily for ten consecutive days.

In Cremer's district of Western Germany diphtheria for some time has been developed from a children's disease into a disease more frequently seen in adults. During the spring of 1946, for every 50 cases in persons under 17 years of age, 360 cases in persons over 17 years of age were reported. Myocarditis is the most frequent complication of diphtheria in persons over 17 years of age. Therefore, continuous electrocardiogram control is required, even starting before toxoid therapy is initiated. Cremer has treated 95 persons with the new toxoid therapy. Of these, 60 remained free of myocardial damage and 35 showed some signs of damage in the electrocardiogram. None of the 95 toxoid-treated patients died, while a mortality of 4 to 5 per cent would have been expected without the use of toxoid (with antitoxin only).—(J. Cremer, Arch. f. Kinderh., 134 : 106, 1947).—*American Journal of Diseases of Children.*

CLINICAL IMPORTANCE OF CERTAIN PECULIARITIES OF THE ANATOMY OF THE CHILD

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THIS article is intended to provide the general practitioner with consolidated information about certain peculiarities of the anatomy of the child, that may be of great clinical importance and utility to him in his daily routine.

I. The skull.—It is only partially ossified at birth, the gaps being filled with a membranous structure. These gaps are called

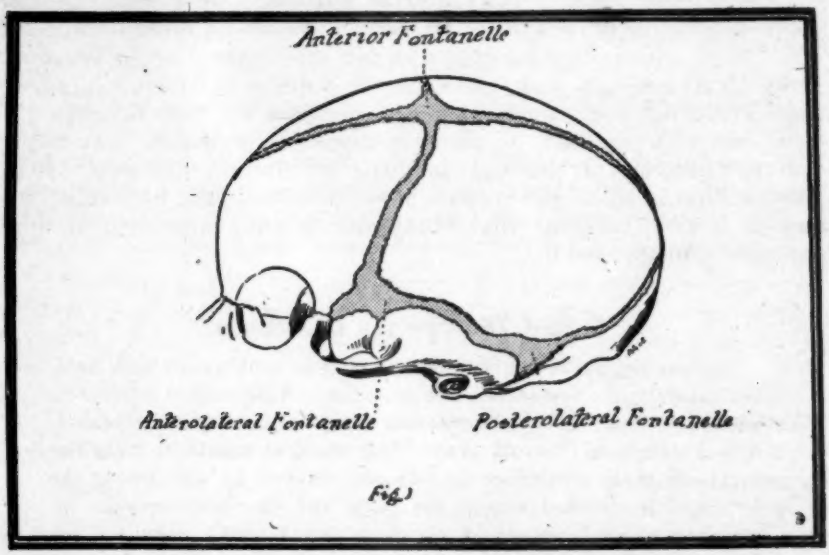

Fig. 1

fontanelles. There are six fontanelles at birth, all being in relation to angles of parietal bones. Two are median and four are lateral. The median fontanelles are posterior and anterior. The anterior one is the most important from the clinical point of view. It is situated at the place where the two parietals and the frontal bones come close together (*Fig. 1*). It is rhomboid in shape and measures about $1\frac{1}{2}$" x $1\frac{1}{2}$". It persists for two years after birth and is a non-rigid area of the skull. This area can be of assistance to a general practitioner as follows:—

(*a*) For venipuncture and venicolysis for administration of blood and other fluids in a child. Through this area, a big venous channel (superior sagittal sinus) can be approached without much difficulty.

The superior sagittal sinus lies at a depth of 1/8th to 3/16th inch from the surface, is exactly in the midline and can be approached easily. A small area centred over the fontanelle is shaved. The baby wrapped in a blanket with his arms by his side, is placed on his back. The attendant grips both sides of the head with her hands and steadies the body with her elbows. The operator can either sit facing the fontanelle or stand at the side of the infant. The shaved area of the skin is sterilized. With the left hand, the margins of the fontanelle, which is of the shape of a lozenge, are palpated. A puncture is made, 1/4th inch anterior to the posterior corner of the fontanelle, strictly in the middle line and pointing towards the occipital protuberance (*Fig. 2*). Two definite layers have to be penetrated: first, the skin and the aponeurosis; and, second, the outer wall of the venous sinus. When the blood has been obtained or transfused as the case may be, the infant's head is elevated and the puncture is sealed with Collodion.

Puncture of the Superior Longitudinal Venous Sinus.
Fig 2

(*b*) To find out the state of hydration of a baby. Abnormal depression of the membrane indicates an insufficiency of body fluids. The degree of tenseness of the membrane gives an index of the intra-cranial pressure.

(*c*) For diagnostic puncture of the lateral ventricle.

II. The mastoid process.—This does not begin to develop until the end of the 2nd year and thus the facial nerve is a subcutaneous structure (*Fig. 3, vide page 508*) and is in danger of being cut by an incision behind the ear which extends too far down.

III. The petrous temporal bone.—In the infant there is a strip of cartilage uniting the squamous and petrous parts of the temporal bone. This cartilagenous strip is very thin and lies under the dura and the temporal lobe of the brain. Infections of the middle ear spread readily through this cartilage to cause meningitis or abscess (*Fig. 4, vide page 508*). Thus infections of the middle ear should be treated very early in children if these complications are to be avoided.

IV. The auditory tube.—This is relatively wide at birth and the infection of middle ear and mastoiditis are common. Therefore the infections of the tonsils and adenoids should be treated at an early date.

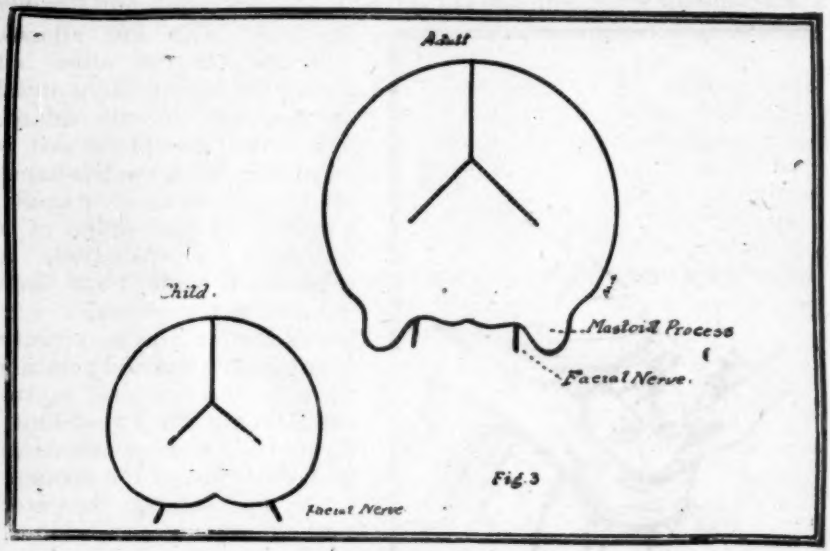

Fig. 3

V. The external auditory meatus.—This is relatively small and straight and thus the tympanic membrane is very much nearer the surface and stands in danger of being injured if the speculum is pushed in carelessly.

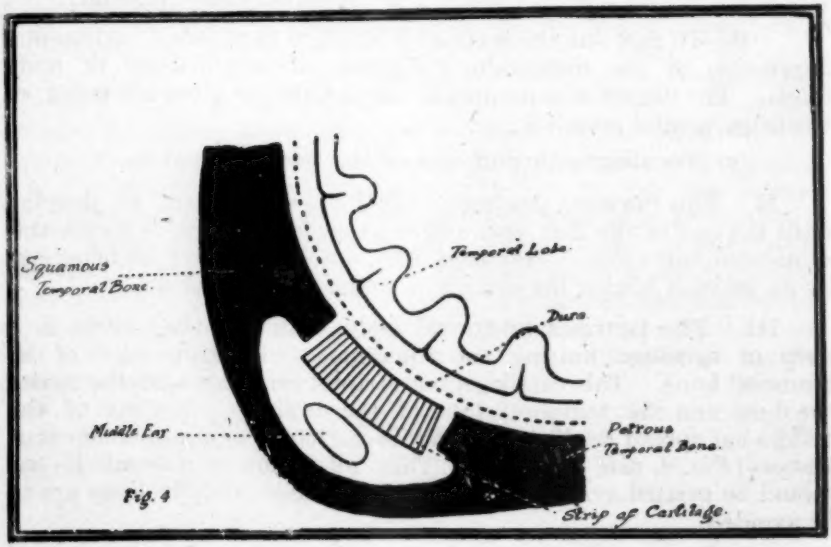

Fig. 4

VI. Frontal sinus.—This does not exist at birth. It begins to develop as an outgrowth from the nose during the first year. It is rarely evident before the 7th or 8th year. It reaches full development between the 15th and 20th years.

If this fact is recognised, one can exclude the frontal sinus disease in children of less than 7–8 years of age.

VII. The respiration.—This, in the first two years of life, is almost entirely abdominal (diaphragmatic), due to the circular shape of the thorax and horizontal position of the ribs. It changes to thoracic as the ribs assume oblique position during growth. After abdominal operations in children, as there exists then an abdominal wound which is painful on respiratory movements, the child restricts these movements as much as possible, thus interfering with the excursions of the diaphragm. The result is that the lungs are improperly ventilated and secretions tend to accumulate in them which may become infected and cause pneumonia.

Thus any child with abdominal operation should be made to breathe deeply and encouraged to cough by giving regular Carbon dioxide inhalations.

VIII. The liver.—This is relatively very large at birth and occupies much of the abdominal cavity, and is felt easily per abdomen in a normal child. This fact should always be remembered if erroneous diagnosis of enlarged liver is to be avoided.

IX. Perirenal fat.—There is very little perirenal fat in a child and the kidney is intimately related to the peritoneum. The peritoneum is therefore often torn in injuries to the kidney, and intraperitoneal hæmorrhage giving rise to signs of free fluid in the abdomen, is common.

Furthermore, perinephric abscesses are very common in children due to absence of this perinephric fat and easy passage of organisms from hepatic and splenic flexures of the colon which lie in intimate contact with the kidneys on the right and left side respectively. Perinephric abscess must therefore be excluded in cases of pyrexia in children where the cause is not obvious.

X. The omentum.—Localisation of intraperitoneal inflammation is poor in children due to poorly developed omentum, and children therefore should be operated early for conditions like acute appendicitis.

XI. The urinary bladder.—The fact that the bladder is an abdominal organ is taken advantage of in diseases of urinary bladder in children. In cases of acute retention it may be aspirated per abdomen, without any fear of peritonitis.

XII. The large intestine.—In children appendices epiploicæ are not present and the surgeon therefore finds it difficult to identify the large intestine in abdominal operations. We are not certain about the exact age of their appearance. However, work is being done to determine the same.

THE CHILD AS A SURGICAL SUBJECT

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THE child is not a miniature adult and the new born is not a miniature child. Many experiences in both Medicine and Surgery prove the value of this saying. By applying simply the Laws of Surgery in children soon we would meet with failure after failure. The child is a growing individual, is obeying special, very characteristic physiological and patho-physiological rules. The response to any pathological impulse will be given according to its own laws, not according to the laws which are governing the adult organism. The normal anatomy of a child differs widely from the anatomy of an adult organism. The pathological changes are mostly to a certain extent different and characteristic too.

Without any doubt children can support great and greatest interventions by observing some—mostly very simple—rules of pædiatric surgery. This statement of mine is proved by hundreds and thousands of successful brain, heart, thoracic and big abdominal operations in children.

There is no doubt about it, that modern medicine has grown too vast for one human brain. But it is equally true that the "University" principle cannot be neglected altogether. Progress in details are made by workers, specialized in one very limited field of science, but the solutions of big problems are waiting for scientists, who have acquired sufficient knowledge in many different fields of science.

In consequence we need specialists in many limited fields within surgery, nevertheless it must be emphasized, that surgery is a clinical entity and a man who is worth this distinction must be conversant with the whole subject to a certain extent.

In every big centre in the West there are surgeons with special liking for pædiatric work. Such men are gradually specialized in it, giving up the surgery of adults. Yet many emergencies must be dealt with by a general surgeon and to a certain limit—in remote places—by general practitioners. But it is clear, that any general practitioner must be conversant with the special indications and aspects in pædiatric surgery.

To start with, there is the age, which must be taken into consideration in dealing with a special case in pædiatric surgery.

For the delivery the child is provided with a liberal amount of antibodies from the maternal organism. This provision will last for 24–48 hours, henceforth all the life-threatening congenital abnormalities must be operated during the first or second day of life. If for some reason or other that is not feasible, the operation—if not an emergency—must be postponed to a later date, when the child is

regaining his original weight. Still better it is to wait patiently until the increase is steady and the body weight is at least 10 pounds.

The ano-rectal atresia is likely to reach the surgeon on a very early date. I am not speaking of the imperforate anus, in which the closing membrane can be split by any practitioner, but about the more severe degrees of that kind of malformation. In 24 hours sufficient gas is swallowed by the child to reach the lowest part of the intestine. Then the hour of operation must be fixed, immediately after an X-ray of the child is taken in head down position, showing clearly the distance between the anal surface and the intestine. It is a rule that, when the distance is wider than 2 inches, colostomy must be done. We ought to postpone the very intricate operation necessary to bring down to the proper place the intestine, if feasible, to a later date, mostly around the second year, when the child will be sufficiently strong to support such an operation and the tissues will be sufficiently differentiated to help the surgeon to reconstitute the normal position.

To open the passage is an emergency, to postpone the operation will multiply the danger: the organism of the child will be no more protected by the maternal anti-bodies, the toxicosis developing from the intestinal obstruction will also weaken the resistance of the child.

Yet it would be an error to think, that the operation, from below or even a colostomy, as a last resource, is an easy one. The tissues of the newborn are not so differentiated as in an adult, moreover they are friable. Sutures can cut through, frustrating all our surgical work. The region, when we are operating from below, is a very vascular one and the child is very badly supporting even a small amount of blood loss.

Equally it would be a great error to postpone the operation, because of the expected technical difficulties. The newborn at least is a healthy individual, which condition is many times more precious for us as the small difference in an easier technique, because of the little bit more differentiated tissues.

If the atresia is complicated with fistula, the child with a fistula leading into the bladder or into the ureter must be operated without delay. The operation of other fistulous cases, if the safety valve, that is the fistula, happens to be sufficiently large, can be delayed until the child is strong enough to support the detailed plastic operation.

It is quite obvious that amniotic hernias, myeloceles (if feasible and sensible to operate) must be operated immediately after birth.

The congenital pyloric stenosis, if congenital at all, and the duodenal obstruction in the newborn must be clearly differentiated, because the decisive time factor can only so play the important part in our consideration. The congenital pyloric stenosis will cause

symptoms 8–14 days after birth, the duodenal obstruction 24–48 hours after it. The latter must be operated immediately, if we want to be successful. The pyloric stenosis might be treated for a very short time conservatively, but the best results have been recorded from clinics in which early operation is accepted as a routine. Dessicated, cachectic babies would not support the operation at all. All over the world the Ramstedt operation is accepted. By performing this operation, we ought to know that every single muscle fibre of the hypertrophic muscle mass must be severed.

Only recently are recorded successful cases about babies suffering from congenital obstruction of the extra-hepatic bile ducts. Such kind of operations are technically extremely difficult. It is an interesting fact to know that some babies, who have not been operated, can survive with complete obstruction one year or even somewhat longer.

The cleft lip in a healthy newborn is to be operated in the first or second day. Alimentary and respiratory troubles can cause in such a baby, if left unoperated, serious complications, even fatal ones. If the cleft lip is connected with the cleft palate only, the closure of the cleft lip must be done in the newborn. The closure of the cleft palate ought to be postponed so far as the 18th–20th month of life. The best technical solution in a child who is already speaking, would only very slightly ameliorate the speech of the child. The result in any cleft palate operation is not dependent on the closure of the gap. The closure must be performed in such a way, that the physiological function of the soft palate shall be restituted to normal. Equally important is the speech-training after operation. It is a lost case if the mother happens to suffer from cleft palate too. This speech-training, which is absolutely the domain of the respective mothers, is a very hard problem over here.

Speaking about the time factor we ought to consider the congenital hernias. It is very rare to be compelled to operate on a simple congenital hernia at an early time in life. It would not be wise to do so. First of all many of the congenital inguinal hernias will disappear later in life with or without any conservative treatment. If because of the tendency to incarcerate, or because of rapid enlargement, we would consider it wiser to operate, we can do so safely after the 6th month on a healthy baby. In weak babies it is better to postpone the operation until the baby is getting mixed food, that is around the 10th or 12th month. It is a common error over here, that babies are far too long breast-fed. As regards technique, hernioplasty is generally contra-indicated, what is necessary is to remove simply the sac.

It would be a big error to rush into any kind of hernia operation, except the strangulated ones, without controlling first the respiratory or alimentary troubles, common causes of the rapid enlargement or threatening strangulation.

The congenital umbilical hernia has 3 characteristic features. It is conically shaped, small and the content is freely movable. Thus there is no danger of strangulation. It is very likely to heal spontaneously in the first 2 years of life. Strapping by elastoplast is fostering the healing process. If up to the age of 4–5 closing is not achieved, operation is indicated.

Strictly speaking, most of the so-called congenital umbilical hernias are not at all congenital. The umbilicus is only gradually closing after birth. If in the first one or two months, cough, constipation or diarrhœa supervenes, hernia might develop.

The undescended testis seems to be a very interesting problem, no agreement is reached yet concerning the best method of treatment. In the first year of life a certain number of undescended testis will reach the scrotum, that will complete the descent. It is true that many undescended testis are simply retractile testis, in which case the strong cremasteric muscle will pull up the testis into the superficial inguinal pouch. Such a retractile testis will sooner or later reach the scrotum and remain there. By evaluating the results of conservative treatments it is very important to think about that eventuality which is not infrequent at all.

The undescended testis is more liable to malignant degeneration.

Gonadotropic hormones are claimed to have a certain action to foster the descent by prolonged use in small children.

Any operative method is able to bring down and to fix in the scrotum the undescended testis, nevertheless in the majority of cases no further development can be observed and spermatogenesis will be certainly missed.

It is very interesting to note that if operation has been done on both sides, one testicle is likely to develop normally and even spermatogenesis can be proved.

By taking into consideration that in small children no malignant degeneration is likely to occur, it is a convenient solution to wait for the operation until the age of six if, with or without conservative treatment, the testis remains still undescended.

The hypospadiasis and the less frequent epispadiasis must not be corrected urgently. To such a plastic operation we need a liberal amount of skin. We will have that at our disposal if the child is somewhat older. I like to perform such an operation between 4 and 6 years of age, that is before the child goes to school.

The extroversion of the bladder can be cured seemingly definitely by transplantation of the ureters into the recto-sigmoid and excision of the extroverted bladder. Many cases operated 20 years ago, or even more, are still alive and healthy. The immediate danger of such an operation is insignificant by using the modern Sulpha therapy and dividing the operation into 3 stages. Nevertheless over here I would not rush with such a kind of operation. My

experience can be only a very limited one in this country, but it seems to me that adults are supporting very easily the transplantation of the ureters, but the children are getting through the operation without difficulties, even ascending infection is not developing at all yet, they are slowly losing their weight, their appetite disappears completely, they are getting less and less interested in their surroundings and will die in some months' time or so and we will be unable to detect any marked pathological condition with our present equipment it was not possible to prove that some toxins are getting absorbed from the child's recto-sigmoid, which is not absorbed through the mucosa of the adult. This danger seems to be in inverse proportion to the age of the child, hence we might delay the operation up to the age of 10. According to my experience it is not likely that the kidneys are getting infected in a young child if no manipulation is attempted to stop the flow of urine. To the technical side of the operation it is necessary to know, that the ureters ought to be liberated only to such an extent, that no tension shall be present when the transplantation is carried out. It is very important to save as much from their blood supply as possible, that is, not to clean them from the surrounding fatty tissue. The transplantation itself must be so simple as possible.

Avoiding operation in the early adult life, ascending infection or malignant tumour formation will lead to fatal consequences.

The congenital hydrocele must not be operated. One or more aspirations will cure the condition. Use of sclerosing fluids is not necessary. Trans-illumination before aspiration because of complicating hernias and anti-position of the testis is necessary.

It is understood that any form of intestinal obstruction can be found in childhood, yet there is a special form, which must be specially mentioned, the intussusception.

The patient is mostly a strong male baby around the 8th month of age. The trouble starts suddenly abdominal colics with intervals of relief. Called soon after the onset it might be life-saving to the child to do a rectal examination. Blood-stained slime will cover our gloved finger. In such an early state conservative treatment will be efficient in about 90% of cases. The treatment is very simple, water enema with a pressure head of 60 cm. The result must be verified by barium enema.

In later cases, or if conservative treatment fails, operation must be done. In cases operated in time gentle pressure on the intussuscipiens will prove efficient. Pulling on the intussusceptum is strictly forbidden. If the first gentle attempt fails, the intestine is returned into the abdominal cavity and packed in compresses, soaked in warm saline. After 10 minutes or so, a new attempt is made, if unsuccessful resection must be done. To force the reduction, to repeat it innumerable times, will certainly lead to very high fatality rate, caused by irreversible shock.

The congenital dislocation of the hip is almost always not at all congenital. The disposition is congenital, but it is only very seldom detected. This disposition is caused by the hypoplasia of the joint, the treatment—retention or reduction and retention—must last 1–2 years. In the 2 first years of life the prognosis is excellent, up to the 6th year the prognosis is good, from this period onwards the usual treatment is no more feasible and some kind of operation must be performed.

It is a common error to stop the conservative treatment too early, that is before acetabulum shows a normal configuration.

The second most frequent congenital malformation from orthopædic side is the talipus. This is a real orthopædic emergency. Two faults are rather common in the treatment. To reduce with undue force, without proper knowledge of the true nature of the malformation, and, secondly, to stop the treatment in 6–12 weeks, when the configuration seems to be normal. The treatment, perhaps only supervision, can only be stopped, when the muscle power of the supinator muscles is in balance with that of the pronators, usually when the child is walking.

The infantile paralysis offers a big lot of very valuable work to the surgeon. In dealing with such cases some rules must be strictly observed.

For surgical purpose 4 states can be differentiated, the preparalytic state, the paralytic state, the state of reparation and the end state. If the surgeon is called in time he cannot simply wait until in one or one and half years the end state is reached. He ought to fight against the 2 big dangers: the over extension of the paralysed muscles and the contracture of the healthy antagonist. Reaching the end state he must correct first the contractures already present inspite of his care, after that 1 or 2 years must be left, to give time to the muscles to recover so far as it goes, liberated from over extension. Only after this time period the different, more or less elaborate, operations can be performed for restitution of the lost muscle power.

The surgeon must not be keen to solve the whole problem in one stage. It is better to divide the necessary operation in so many stages as possible. First in such a manner the correction is less load for the child, secondly if one operation fails, not too much is lost, it will be easy to correct it within the next stage.

The chapter of the pyogenic infection is one of the most important in pædiatric surgery. A certain resistance against pyogenic infections is only slowly developing, due to repeated insignificant or more or less severe infections. In children, living in poor surroundings, that is more evident than in children of better class people. Excepting children in very low condition, the elastic and unimpaired circulation, the healthy kidneys, liver and other vital organs are

outweighing the mentioned handicap to a certain degree. The answer of the organism to the chemotherapeutics and antibiotics is more marked as in adult life. The Sulpha drugs are well tolerated, the dose according to the body weight can be 3 times higher in small children as in adults. We have been very conservative ever since in regard to children suffering from acute empyema. In the era of chemotherapeutics and antibiotics this conservatism has even more right. Aspiration and intrapleural injection of the drug will avoid opening of unlocalized empyemata with almost always fatal result. The danger is to push too far our aspiration treatment. In that case chronic empyema may develop. In a case, which is not yielding to aspiration, a closed drainage in due time will be mostly sufficient to cure our little patient.

In the pre-Penicillin era it was obvious, that the acute hematogenous osteomyelitis was an incurable disease. Irrelevant whether we did follow an extreme active, a moderate, or an extreme conservative surgical treatment, recurrences occurred even after 20 years of perfect health. At the time being, if the case is seen shortly after onset, even the subperiosteal abscess formation can be avoided. If an abscess has been already formed aspiration and subperiosteal injection of Penicillin will mostly achieve complete cure. If not, we will simply incise the practically sterilized abscess.

It must be remembered, however, that up to the age of 2 the infecting organism is mostly the streptococcus. In such a young child the inflammation might spread through the epiphyseal cartilage and reach the joint. It is equally important to know, that so far as our present knowledge goes, some kind of bony destruction cannot be avoided even with the earliest Penicillin treatment. Therefore immobilization of the limb is still essential.

Whether or not the early Penicillin treatment is able to secure definite cure, without the danger of late recurrence, cannot be answered at present.

Pneumococcal peritonitis, chiefly the primary form, is the disease of female children in the age period between 2 and 10. The onset is acute, temperature and leukocyte counts are high. In early cases, the pelvic region, later on the peri-umbilical region will be the most tender spot. Cyanosis, at least some bluish tinge, is present on the lips and on the top of the nose. Herpes of the lips or nostrils is very characteristic too. Nevertheless, from time to time, we will meet cases in which it would not be possible to exclude a severe form of appendicitis. In my opinion, in such a case, the simple exploration in local anæsthesia from a small grid iron incision is less dangerous as to try to aspirate some fluid from the abdomen when there is not yet a localized fluid collection.

In obvious or verified cases Penicillin and Sulpha drugs will control the infection if the treatment did not start in a dying overtoxicated child.

From the big mass of common pyogenic infections I would only mention 2 peculiarities in children. In a child, after an exhausting infectious disease, any kind of common pyogenic infection is very likely to be generalized, but in pædiatric surgery it is no hopeless septic case. Sometimes we might think, because of our modern treatment, that even a dying child can be saved. I ought to mention, that girls around and during the puberty are very sensitive to pyogenic infections and their natural resistance seems to be very low.

In India, in many places, the goitre is endemic, consequently it seems to me very important to consider that problem from the point of view of the pædiatric surgeon.

The demand for thyroxin in the growing organism is great. In many a child, around the puberty, the thyroid gland can only meet the demand by hypertrophy. Such a juvenile diffuse goitre must not be treated at all. It will in most of the cases disappear around the age of 20. Nodular goitre or primary or secondary hyperthyrosis can be encountered in children. Hence, theoretically, indication for an operation could be justified. Yet it is wise to postpone the operation up to the age, when the organism is fully developed and to operate earlier only because of vital indication. Such a vital indication is an incarcerated retrosternally situated big nodule or a fulminant hyperthyrosis.

There are 2 conditions, which only I mention, because they are too frequently forgotten, that rarely they can occur in childhood. Appendicitis, because of anatomical reasons, is very rare under the age of 2. Still there is a possibility for it. It is practically impossible to find typical tenderness or rigidity in a crying child. It is a luck, if the doctor happens to find the child sleeping, still we cannot count on that. To examine the child in a prolonged lukewarm bath might help. In difficult cases even a light general anæsthesia is permitted, to continue with it during operation if the diagnosis is affirmed, or if appendicitis still cannot be excluded. It is better to take out 9 healthy appendices from not otherwise seriously ill children, then to risk a perforation in one single case. In older children appendicitis is quite frequent. We must remember that it is a lymphoid organ, that the child has a low acidity, and in consequence quite often appendicitis follows some kind of tonsillitis. Measles, scarlatina, typhoid in the early stage can mimic appendicitis. In such a case the operation is not only unnecessary but is definitely harmful for the child.

The low acidity of their stomach protect the children from peptic ulceration, and in consequence even in adolescence peptic ulcers are exceedingly rare. Nevertheless, peptic ulcer might occur in rare cases even under the age of 10. Interestingly, peptic ulcer in children is taking rather a serious course. Can be, because it is not detected in time, can be because it develops only in children with a marked disposition for that disease. Severe bleeding, pyloric stenosis

is not uncommon in such a case. The treatment should follow general surgical lines. The children so treated are developing normally. The dreaded peritonitis type of anæmia after partial gastrectomy has been never proved in our very extended material, including our operated children.

The extra-pulmonary form of tuberculosis is very frequent in childhood. Bone and joint tuberculosis is most frequent in the first 5 years of life. Tuberculous lymphadenitis is frequent chiefly on the neck and mesentery. To avoid errors we must remember that in young adolescents Perthes' disease can cause considerable difficulty in making differential diagnosis between it and tuberculous coxitis. Equally important to know is that mesenterial lymphadenitis can have its cause in pyogenic infection.

In adult life the enteral form of tuberculosis is almost always associated with pulmonary tuberculosis. In children it can be a solitary clinical manifestation.

Late tuberculization associated with heavy infection can lead to easy generalization and fatal outcome.

Generally speaking, any tuberculous infection in small children, causing first a localised pathological change, is very prone to generalize, due to the imperfect protection which is only gradually and slowly developing. Therefore, the severity of any tuberculous infection is in inverse proportion to the age of the child. Any infectious disease is likely to flare up a slumbering tuberculous infection in childhood.

The high protecting power of vaccination has lately been proved by the immense material gained by compulsory vaccination in Russia. About Streptomycin no definite opinion can be given at present in surgical cases.

Generally speaking, the grade of malignancy of a malignant tumour in childhood is just as well in inverse proportion to the age of the child. Taking into account that in most of the cases we are facing very advanced stages, because the possibility of malignant tumours in childhood is not sufficiently born in the mind of the general public, it is not advisable to perform any drastic, mutilating operation. It would not secure the child from recurrences. The pre- and post-operative X-ray treatment is a very delicate matter, because of the very sensitive skin of the child, which can be very easily damaged by X-rays.

Burns are, in my opinion, more frequent over here as in the Western countries. Children can easily lose a higher proportion of their body weight in fluids, as adults. Therefore burns are more dangerous in childhood as in adult life. Plasma in the needed amount can scarcely be afforded for most of our patients. To cover the epithelial defect as early as possible must be our primary effort. We must remember that grafts from any donor can take temporarily. So it would be possible to overbridge the critical period and

proceed with autografts when the child is sufficiently recovered. Furthermore, we ought to remember that early grafting will prevent infection. In late cases we must not wait until the whole surface is ready for grafts, but we might proceed in stages. Amnion might prevent the excessive fluid loss, besides it might even take and be transformed entirely or partly into smooth skin. Definitely it fosters the epithelization. To wait for scar formation is a big error not counting the danger of contractures and the high costs. Keloid formation after extensive scar formation is very common over here and keloids are potentially malignant.

Due to special anatomical and physiological causes, fractures are usually very well healing in childhood. Even marked angulations are completely corrected by the growing bones in some years' time. One factor must be remembered, that is not to interfere with the blood supply of the limb. If the displacement of the fracture is preventing the free blood supply, immediate and efficient treatment must be sought to liberate the vessels. In childhood we must be very careful in applying plaster cases. The child is prone to develop very quickly extensive œdema, thus interfering with the necessary blood supply. It must be a rule not to apply plaster cases at least in children, without having steady control over the patient. Oedema formation, anæmia, cyanosis, loss of function, continuous pain, coldness or even only tingling will indicate to cut immediately the whole plaster case to restitute the impaired circulation, lest the big danger of Volkmann's ischemic gangrene threatens. It is a tendency to treat rather the skiagram and to neglect the aim to restitute the best possible function. It is true that, in most of the cases, the perfect alignment will secure the best possible function, but not always. To preserve the function is our primary care and even we might sacrifice the anatomical alignment, knowing that later on this defect will be corrected without our preoccupation. Therefore most of the very elaborate methods of fracture treatment can be safely discarded in childhood.

I would like to mention 2 practical rules which proved very valuable in dealing with fractures in children. High temperature after a plaster case is applied is heralding skin necrosis, hence the case must be immediately split or removed, if no other cause of the high temperature is to be found. The skin of the children, as I have mentioned already, is much more sensitive to X-ray damage as in later life. Too many screenings, too many skiagrams can easily cause X-ray burns.

Now speaking about intrathoracic operations, our routine has been to operate the children in local anæsthesia, if needed, combined with a very superficial general anæsthesia, if and when it was needed. In expert hands—because of the miniature anatomical proportion of the child—low spinal anæsthesia is a very safe procedure in children; on the contrary, there is a widespread opinion that spinal anæsthesia

cannot be used in childhood. The occasionally dropping blood pressure is in no time corrected by the very elastic circulation of the child.

The success of our local anæsthesia will largely depend on the friendly relation of the child to the team, mainly to the anæsthetist, who is there to control the child during operation. If for some reason or other general anæsthesia is preferred the smooth introduction of the anæsthesia is again in direct proportion to the friendly relation, and the friendly behaviour of the anæsthetist to the child. Too brisk introduction with very marked excitement will herald serious trouble during operation. The very sensitive nervous system gets overexcited during the introduction period and will be more apt to a neurogenic type of shock.

Coming to the general surgical technique, I may state that it is essentially the same as for the operations in adult life. Nevertheless, one point must be stressed. Dealing with adults many errors, even faults, can be committed in the majority of cases without any harm to the patient in question. In pædiatric surgery, alike in brain surgery, errors or faults are very badly tolerated, if at all.

In the pre-operative care the correct feeding of small children is immensely important. It is fairly simple to feed a healthy child, it will be a very complicated job to select for the child the proper food before operation in the days of serious surgical disease. We will appreciate very much the experienced help of the pædiatrician. Fasting and purging have long ago become outdated even in surgery for adults. They might interfere with the so important protein and electrolyte balance.

It is very convenient for operation in babies to use a flat metal container with a concave cover. In the cold season the container can be filled with hot water. Of course we must be careful to protect the baby from direct contact with the container. To this container the baby is securely bandaged and the whole container can be moved for the convenience of the surgeon.

In the hot season it is very difficult to prevent extensive fluid loss by perspiration. The solution for this all important question is an air-conditioned theatre. In any serious case, dealing with small children, we might introduce a small sized catheter through the nose into the œsophagus to secure sufficient fluid intake even during operation. The catheter will be securely fixed to the face of the child and it will be of great help in the early post-operative time. The babies are seemingly not at all disturbed by the presence of the catheter. Even if blood is available, in most cases it is difficult to make transfusion into a small child. The best way is sometimes the vein which runs in the mid of the front. I would warn against making transfusion into the sinus. Without any danger sufficient blood can be transfused into the tibia. I would not advise to use in children the sternum for this purpose. Even in adults this type

of fluid intake is losing day by day its once big popularity. To prevent the baby and ourselves from all this trouble it is imperative to avoid any blood loss during operation. In my opinion the greatest single danger of any kind of operation over here is the blood loss. Not counting the anæmic patients, many of our surgical subjects, seemingly in fit condition, are tolerating very badly blood loss, chiefly during and after operation. We are until now unable to find out before operation which patient will tolerate a moderate blood loss and which patient would not. Children in inverse proportion to their age are even more sensitive to blood loss as adults.

To prevent drying out and cooling down of tissues and organs, not to pull and push and press tissues and organs briskly, are general surgical rules. These very rules are vitally important in children. Observing them vigorously will enable us to perform great and greatest operations even in small children.

It is very important to place our sutures without any tension and very carefully, because in the very friable tissues of children the sutures might cut through.

Collodium provides a very good and cheap air- and water-tight cover for completely closed wounds. In pædiatric surgery its advantage is enlightening.

In the post-operative treatment of serious operations the mentioned feeding through a small sized catheter, introduced through the nose, will give excellent results in small children. In such a manner it is fairly easy to maintain the so necessary protein and electrolyte balance.

In small children Anodynes will be hardly necessary. The child, provided the bedding, dressing and perhaps splints are in order, would not show any sign of pain or inconvenience.

To make a long story short, pædiatric surgery must be performed in a most delicate manner. It is never a fault in surgery to be careful and delicate in technique. In children this is simply imperative. It will be a great help for us to be provided with the necessary fine instruments, nevertheless many of the greatest operations can be performed in children with our usual equipment.

In a short article, like the present one, I could only mention some of the typical examples to show the big and important differences between the general and pædiatric surgery. If I could impress upon some of my readers to get themselves interested in this important and gratifying field, I would be sufficiently rewarded.

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ANÆSTHESIA IN CHILDREN

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ANÆSTHESIA in children is not an easy problem. It taxes even the ability of the best anæsthetist during a major surgical operation. Accidents on the operation table and post-operative complications are not uncommon in these cases. So it requires considerable skill, experience and judgement on the part of the anæsthetist while anæthetising children, and he must possess a thorough knowledge of the physio-pathology of the various conditions, for which the operation is required. Besides looking to the safety and comfort of the patient, he must look to the convenience of the surgeon during an operation and help him in the post-operative treatment of the little patient. So his primary object, while tackling these problems, should be to ensure adequate pre-operative preparation of the patient, to make a proper choice of anæsthesia, and, lastly, to see that the patient recovers, smoothly and uneventfully in the ward, after the operation. The first two aspects of the problem only will be dealt with here, as the post-operative measures adopted in children as well as in adults remain practically the same.

A. Pre-operative preparation of the patient.—Soon after admission into the surgical wards, the patient undergoes a thorough clinical examination and a few routine laboratory investigations. A special note is made about the cardio-vascular and respiratory systems. In older children, as in adults, certain cardiac efficiency tests are made to assess the degree of operative risks. They include pulse rate, blood pressure, 'Moot's formula', oculo-cardiac index, myocardial index and 'Crampton-value.'

Associated conditions, such as anæmia, cachexia, dehydration, avitaminosis, inter-current infections, endocrine disorders like diabetes, thyrotoxicosis, toxæmic conditions etc., need proper treatment prior to the operation.

Now coming to the psychological aspects in anæsthesia, the anæsthetist has to win the confidence of the little patient and the anxious-looking parents and relatives. To achieve this object, he must be familiar with them a few days before the operation, with an occasional charming smile and reassuring words. Children, except infants and very young ones, remember about past events in life quite well. The psychic trauma that may be inflicted by the ordeals of anæsthesia and operation may be too great to affect the future mental outlook of the child, who remains very apprehensive and excitable temperamentally. These may get aggravated during anæsthesia, especially when the parents are found panicky or distressed with the thought of the operation. In such cases, during anæsthesia, the metabolic rate is increased and endocrine secretions

are augmented with a stormy induction, unsatisfactory maintenance and severe post-operative shock. So he must tackle these problems smoothly, by suggestions and cheering words, failing which by adequate sedation of the patient during the pre-operative period.

In emergency operations, however, a detailed pre-operative preparation is not possible.

Starvation of the patient prior to the operation is to be deprecated as it induces post-operative ketosis due to glycogen depletion from the liver which gets easily susceptible to the toxic action of anæsthetic agents under such a condition. The child should be given plenty of glucose drinks in the form of barley, sugar, fruit juice for two or three days before operation. The last drink should be given three hours before the administration of anæsthesia. No milk should be given in the last feed as the clots formed in the stomach may remain and vomited out during induction of anæsthesia. Babies should have their last milk feed 3–4 hours before operation. Where possible, intravenous injection of glucose must be given before starting the anæsthesia. Drastic purgings cause exhaustion to the patients and may be avoided. Clothing should be warm but light and the child should be protected against cold and chill.

Next comes the pre-anæsthetic medication of the patient which is very essential for a smooth and satisfactory anæsthesia. Its choice depends on factors such as age, the physical and mental condition of the patient and the nature of the anæsthetic agents to be administered.

Pre-medication should be given in adequate doses by proper technique and specified route and under the personal supervision of the anæsthetist. Instances are not rare when Morphine has been injected in place of Atropine with fatal results, capsules or tablets of Barbiturates given orally have been spat out without the notice of anybody and rectally administered drugs have been ejected out due to faulty technique. Loaded stomach and bowels may retard their absorption. Some children may resent the rectal introduction of a rubber catheter and get so restless and non-co-operative during the administration of the drug that it gets expelled, unless the buttock is strapped. Post-operative excitement may follow in some cases, but, on the other hand, a severe respiratory and circulatory depression may occur due to their cumulative action in cases of injudicious repetition.

Drugs used for sedating children belong mostly to the group of long acting Barbiturates and those that are commonly used are: Nembutal, Soneryl, Dial and Seconal. But for basal narcosis, Paraldehyde, Avertin and smaller doses of Thiopentone are the drugs of choice. Morphine, Omnopon and Scopolamine, although used in smaller doses in older children, should be avoided as far as possible, especially when toxic volatile general anæsthetic drugs are used. In infants and young children, there is no justification whatsoever for

their use. As to their dosage, mode of administration, indications and contra-indications, a detailed description of these is not possible here. But the following two drugs need some special mention as they are commonly used in children:—

(*a*) Nembutal, for sedation, may be given either orally in capsule or elixir forms or rectally as suppositories. Rowbotham recommends 0·6 grain per stone body weight, for oral administration given about an hour before operation. When administered rectally, the dosage is practically the same but is given three hours before operation.

(*b*) Paraldehyde is administered per rectum in doses of 3i per stone body weight mixed with equal amount of olive oil. The mixture is introduced into the rectum slowly through a fine rubber catheter, three-quarters of an hour before operation. A preliminary bowel wash is necessary. It is quite safe as a basal narcotic in children.

Last but not the least comes Atropine in the domain of premedication. It is used for all cases of general anæsthesia, as it stimulates respiration, checks excessive salivation and mucus secretion and prevents or minimises the incidence of laryngeal spasm and primary cardiac failure due to sudden vagal stimulation under light chloroform anæsthesia. It must be given in adequate doses, three-quarters of an hour before operation. Children tolerate Belladonna group of drugs well and toxic manifestations are seldom seen, unless there is associated pyrexia, dehydration, toxæmias, or acute sepsis, in which cases, its dosage is either reduced or Scopolamine is used in smaller doses in lieu of it.

B. Choice of anæsthesia.—No hard and fast rules can be laid down in this respect. Often it becomes a matter of personal likes and dislikes of the surgeon or the anæsthetist, but it is essential always to consider the age, the general condition of the patient, the degree of operative risks, the length and nature of operation and the various associated pathological conditions present.

Before selecting a drug or a method for a particular operation due considerations should be made of the following facts.—

In children, the metabolic process is high and hence their oxygen requirement is greater. In other words, they tolerate anoxia badly inasmuch as post-operative complications such as surgical shock, ketosis and some cerebral dysfunctions may occur. Thus one may realise the importance of maintaining a clear air-way besides the supply of liberal amount of oxygen during anæsthesia.

Secondly, judgment of the proper plane of anæsthesia is important. A light anæsthesia may invite troubles like laryngeal spasm, primary cardiac failure and poor muscular relaxation; whereas, a deep anæsthesia may produce surgical shock, ketosis and pulmonary complications during the post-operative period.

Thirdly, the anæsthetist must be well-equipped with adequate resuscitative measures to combat the various accidents and complications that may occur during anæsthesia, such as, cardiac failure, respiratory failure, convulsions and surgical shock.

Lastly, he must make a due note of the relative merits and demerits of the different anæsthetic agents and techniques, while selecting them from the children's point of view. A brief account of these is given below :—

Di-ethyl ether is the drug of choice, because of its potency, wide margin of safety, the simplicity of its equipments and its effectiveness in high oxygen concentration ; besides, there are no undesirable cardiac effects nor any damage to the vital organs, unless the patient is anoxæmic. Its chief disadvantages are marked excitement period, excessive salivation and mucus secretion, frequent post-operative emesis and chest complications and occasional convulsions.

Di-vinyl ether is excellent for short operations, the induction being rapid and smooth with a quick recovery. But it is not suitable for maintenance due to its toxicity resembling that of chloroform. At times, it is used as a supplement to Nitrous Oxide-oxygen anæsthesia for relaxation for a short period.

Ethyl Chloride too produces a smooth and rapid induction with early recovery and is used either for operations of short duration or for induction only in those of long duration due to its high toxicity. If given in strong concentration it may cause spasm of the masseter muscles and vocal chords, depression of the vasomotor centre as well as cardiac irritability and hence it has got a narrow margin of safety. To obviate these troubles, a mixture of oxygen and Carbon dioxide must be used in Ethyl Chloride anæsthesia in children.

Chloroform, being a protoplasmic poison, exerts a cardio-toxic effect, besides causing liver and kidney damage if used for a long time. There is no justification for its use in modern anæsthesia except when there is a fire-hazard and non-inflammable agents like Nitrous Oxide and Thiopentone are not at hand. C_2E_3 mixture should also be discarded on similar grounds. Like Ethyl Chloride and Cyclopropane, chloroform and C_2E_3 mixture may cause sudden heart-failure.

Trichlor-ethylene is a safe and non-toxic agent, used both for induction and maintenance, though the anæsthesia is not quite satisfactory. But it is a good supplement to gas-oxygen sequence. Occasionally, tachypnœa and tremors are noticed during its administration.

Nitrous Oxide alone or Nitrous Oxide-air analgesia should not be used in children, as they tolerate asphyxia badly. Sub-oxygenation produced in such cases may cause excessive muscular rigidity,

and bleeding from venous congestion and post-operative complications already mentioned before. Due to the same reason Nitrous Oxide and oxygen anæsthesia is to be used for induction or for operations of short duration only. But in major operations, this should be supplemented with Trilene or Ether when muscular relaxation is required. Moreover, by suitable sedation, basal narcosis, local or regional analgesia or even by a trace or Trilene or Ether, this gas can be administered with a higher percentage of oxygen, which eliminates the question of anoxæmia.

Cyclopropane is as potent as chloroform. It is a strong respiratory depressant, produces ventricular extra systoles and increases blood loss from excessive capillary oozing with severe shock during or after the operation. Even in thoracic operations in children, ether remains the drug of choice over Cyclopropane. As regards the various techniques followed in anæsthetising children, the following need some mention :

Open and semi-open drop methods are commonly used for induction as well as for maintenance of anæsthesia in young children, because of their simple outfit and easy control with adequate oxygenation from the air. Their chief disadvantages are, marked excitement period and occasional apnœa from acapnœa.

Closed and semi-closed methods are not quite suitable for infants and small children as their tidal air volume is small and sometimes becomes too weak to operate the expiratory valve, as a result of which excessive re-breathing, with accumulation of carbon dioxide and the anæsthetic gases, may occur which will produce anoxæmia, shock and even respiratory depression. The use of a smaller re-breathing bag and periodic release of the gases from it into the external air is a judicious procedure in such cases. Rapid induction or even the use of too strong ether vapour, by these methods, may cause severe shock from deep anæsthesia. So, to obviate this trouble, the use of a continuous flow gas-oxygen-ether apparatus with Carbon dioxide absorption outfit and an adjustable ether drip-feed arrangment, as designed by Nosworthy and Hewer, is preferred in children.

Carbon dioxide absorption technique, though safe and is indicated in certain operations, is not much used in children as accumulation of a certain amount of the gas always occurs, due to too much dead space, and respiratory embarrassment may be seen because of the complicated nature of the anæsthetic apparatus.

Rectal administration of ether is seldom used, since the advent of intra-tracheal anæsthesia. But recently rectal Thiopentone has been used in children in 5 to 10% solution, with a dosage of 0·02 gm. per pound body weight. In such cases, adequate pre-operative preparations as for general anæsthesia should be made. It is suitable for endoscopies, minor operations, and examination of the patient under general anæsthesia, when so required.

Endotracheal anæsthesia ensures a smooth and unobstructed respiration, but it should be used with caution and gentleness. In children, the epiglottis is soft, delicate, flexible, and may get impacted into the 'rima glottidis', especially when there is laryngeal spasm. If there is superadded congestion of the upper respiratory passage, it may be easily traumatised during intubation. Hence its injudicious use may invite post-operative complications like œdema of the glottis and infection of the air passages. This anæsthesia is to be avoided in infants as the lumen of the catheter, that can pass into their tiny trachea, may not ensure a smooth and free respiration. Ayre's modified technique in endotracheal anæsthesia for children is quite suitable as it produces no embarrassment of respiration and a uniform anæsthesia.

Endonasal and endopharyngeal methods, though used occasionally, are unsatisfactory procedures.

Intravenous anæsthesia with short acting Barbiturates like Cyclonal, Thiopentone or Kemithal Sodium is seldom used in children below ten years of age. When administered to older children it is used in a weaker concentration, injected slowly and cautiously into a prominent vein. Maintenance of a clear airway and oxygen supply in a liberal amount are of utmost importance. Respiratory depression, when it occurs, may be profound, and prompt resuscitative measures must be taken to save the patient from impending death. This anæsthesia is required when fire-hazard is present but Nitrous Oxide is not available and Chloroform is to be avoided.

Local and regional analgesia are not satisfactory in children, due to their excitable and apprehensive frame of mind. If used, they must be supplemented with basal narcosis or a light general anæsthesia with gas-oxygen and Trilene. Babies and infants, however, tolerate local anæsthesia well. Spinal anæsthesia, though advocated by some people, is rarely used in children due to its attendant risks.

Muscle relaxants, such as Curare, Myanesin, Flaxedil, C_{10} (Decamethonium Iodide), though they possess no analgesic properties, are sometimes used in children as an aid to anæsthesia. But they must be used with the utmost caution as their margin of safety is small and respiratory depression is profound which may affect the heart ultimately. Except in thoracic surgery, where controlled respiration may be required, the use of Curare and its allied drugs is not indicated in children. Griffith rightly observes, "Curare should not be made the excuse for a poor anæsthetic sloppily administered".

In view of all these above facts, the following conclusions are drawn as to the proper choice of anæsthesia in various surgical operations under different circumstances, a few instances of which are given below :—

1. Gas-oxygen-trilene-ether sequence, is the most suitable form of anæsthesia, almost in all major operations.

2. When intra-tracheal intubation is indicated, Ayre's modified technique is to be followed.

3. When the general condition of the patient is good and a gas machine is not available, Ethyl-Chloride-ether for induction and ether with oxygen for maintenance is the next choice.

4. The rest are to be judiciously avoided and their use is to be considered only under exceptional circumstances.

5. When the general condition of the patient is bad or toxæmic features are present, toxic volatile drugs must not be used. In such cases, premedication with rectal Paraldehyde and local infiltration analgesia with 0·5% Novocaine is indicated. If necessary, this may be supplemented with a little gas-oxygen-trilene. Adequate warmth, fluid transfusions and oxygen administration are essential to combat shock in these cases.

6. The same principles hold good for severely anæmic, cachectic and dehydrated cases. Ether may be used with high oxygen concentration.

7. Orthopædic cases require good relaxation for proper manipulation of the bones and joints. Ethyl Chloride-ether or gas-oxygen-ether is ideal.

8. In intracranial operations, if the patient is comatose, local infiltration or field block is enough; if patient is conscious, preliminary basal narcosis, Ethyl Chloride-ether for induction, and intratracheal gas-oxygen-ether for maintenance. If diathermy is to be used, eliminate ether entirely from the circuit. In older children, supplement gas-oxygen with intravenous Thiopentone or Kemithal Sodium administered intermittently at the intervals of 15 to 20 minutes in small amounts.

9. In nasal, oro-pharyngeal and laryngeal operations, intratracheal gas-oxygen-ether is required.

10. In endoscopies and removal of foreign bodies from the air passages and the œsophagus the same sequence is used, but if fire-hazard is present, ether is replaced either by a little chloroform or intravenous barbiturates. Tracheotomy instruments must be kept ready in such cases.

11. In Ludwig's angina and other inflammatory or neoplastic conditions in the neck, asphyxia may cause laryngeal spasm. So Cyclopropane or C_2 E_3 mixture is to be used in place of Nitrous Oxide or Ether with adequate oxygenation. Intubate, where possible. If the patient's condition does not permit the use of the above agents, local infiltration and a little Trilene is to be used. Keep instruments for tracheotomy in readiness.

12. Similarly, in children with obesity, short neck or high palatal arch, mechanical obstruction of respiration is common. Ethyl Chloride-ether sequence with oxygen and Carbon dioxide is used in these cases. Gas-oxygen induction is contra-indicated here.

13. In various intrathoracic operations, including those for correction of congenital anomalies in the heart, œsophagus and diaphragm, intratracheal ether with oxygen is the anæsthesia of choice. When the chest cavity is opened, controlled respiration is started by Carbon dioxide absorption or minute doses of Curare. Cyclopropane may be used in places of ether in such cases, but sparingly. Frequent suction of the tracheo-bronchial tree helps in preventing contamination of the healthy lung with foul materials from the diseased sides. In infants and small children controlled respiration is not much required ; rather it is a hazardous procedure to suspend the natural respiration in them, in as much as the depth of anæsthesia and the degree of surgical shock cannot be assessed correctly. Warmth and transfusions of blood, plasma or glucose saline are necessary.

14. In intra-abdominal operations, intratracheal gas-oxygen-ether is ideal ; packing of the throat prevents aspiration of the vomitus into the lungs. In acute abdominal conditions, such as congenital pyloric stenosis, intussusception, intestinal obstruction, appendicitis and general peritonitis, operative risk is high due to the low condition of the patient and the associated toxæmia. In such cases, gas-oxygen-trilene-ether (in minute quantity), supplemented with local infiltration or pararectal block with 0·5% Novocaine is quite suitable. In jaundice and other cases of liver derangement, ether is avoided and rectal Paraldehyde for premedication with gas-oxygen and local analgesia are required.

15. Infants and new-borns need only a light general narcosis, even with the limbs moving and being restrained by the nurse, in most of their operations. While a sensitive structure is operated or when adequate muscular relaxation is required, local infiltration with 0·5% Novocaine serves the purpose well.

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Adoption Problems

Adoption should never be undertaken without medical advice. Only a doctor can judge the risks of illness in a child who is for adoption. Mental deficiency and mental illness, epilepsy and psychopathy should be considered in the first place, as possible inheritable qualities. The majority of undesirable adoption cases concern mentally deficient children. All children intended for adoption should undergo thorough physical and mental examinations. The physician should be enabled to repeat his control examinations from time to time. The natural and the prospective parents should also undergo somatic and mental examinations. Adoption by a single woman should not be fostered without urgent reasons. The natural parents should give up all contact with the child they have given away for adoption.—Torsten Thysell, *Ann. Paediat.*, 173 : 267, (Oct.) 1949.—*American Journal of Diseases of Children.*

NECESSITY OF X-RAYS IN THE DIAGNOSIS OF DISEASES OF CHILDREN

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IN children, in view of the difficulty of obtaining a correct history of disease and an accurate knowledge of its signs and symptoms, X-ray examinations can often give a very valuable help in arriving at correct diagnosis. The object of this article is to describe in brief those diseases of children in which X-rays are of diagnostic help.

Bones and joints.—*Acute osteomyelitis* :—In children the disease is usually hæmatogenous, with or without history of trauma. In early diagnosis of this disease comparative X-ray photos of very good quality are essential, as no gross changes are visible for about a fortnight after the onset of the disease. The earliest change is an ill-defined area of bone absorption, single or multiple, which must be carefully looked for. Later, a fine opaque line of new subperiosteal bone formation gives a clue. Later the areas of rarefaction coalesce and the fine line of the subperiosteal new bone becomes thicker and irregular. The extent of these changes is inversely proportional to the virulence of the infection. If it is very virulent, there may be no radiological evidence, the whole layer of periosteum being stripped off, and the whole shaft may necrose without the formation of the involucrum.

Chronic osteomyelitis :—The chief feature of chronic osteomyelitis is the predominance of bone production over bone destruction. The bone undergoes much sclerosis and thickening and, within the enclosed area of rarefaction, the dense shadow of a sequestrum may be seen.

A Brodie's abscess is characterized by a cyst-like area of rarefaction surrounded by a zone of sclerosis. It is differentiated from a bone cyst by the presence of sclerosis surrounding the area of rarefaction and its margin is not so well defined.

In tubercular osteomyelitis, common sites are spongy bones of vertebræ, small bones of hand and feet and the ends of long bones. The disease is usually hæmatogenous. A trauma may localize the lesion or there may be multiple bone lesions.

Comparative views are again essential for early diagnosis. In a joint the earliest change may be an effusion causing widening in the joint space. In spine, diminished intervertebral space may be the earliest evidence.

Tubercular lesions are marked by the predominance of osteoporosis. When there is caries, the destruction is of molecular type and no large areas of rarefaction should be expected. There may be just a blurring of the normal trabecular pattern giving a ground glass appearance. If the destruction is massive, larger areas of

rarefaction may be seen. The articular surfaces of the bones become irregular and lose their smooth contour. In tubercular dactylitis, there is a cyst-like area of rarefaction, with a certain amount of expansion, simulating an osteoclastoma.

In syphilis, osteosclerosis dominates over osteoporosis. The lesions are usually multiple. In the congenital type, diaphyseal ends show osteochondritis. The density of the regions is diminished and the zone of temporary calcification is broader. The metaphysis may show fragmentation or disintegration. Syphilitic periostitis and osteo-periostitis cause much thickening and sclerosis of the bones. Irregular areas of rarefaction may be present within the thickened bones. In skull this gives a moth-eaten appearance. In syphilitic epiphysitis, the epiphyseal line is widened. A line of periosteal reaction may be present and occasionally the epiphyses are detached.

Osteodystrophies.—*Osteogenesis imperfecta*:—The cortex of the bones is very thin and the cancellous pattern hardly visible. The bones are bowed and mis-shaped, may show multiple fractures with callous formations round the fractures, but the fracture line remains visible. The shaft of the bones may show atrophy.

Achondroplasia:—The bones are broad at the ends and their shafts are short, giving the so-called collar-stud appearance. The epiphyseal centres appear prematurely.

In osteo-chondro-dystrophia fœtalis of the hyperplastic type, the epiphyses are broad and fungus shaped. Ossification is delayed and the diaphyses remain short. In the other variety, there is marked deficiency in the length of bones. The bones are bent and buttressed.

Morquio's disease is a variety of fœtal chondro-dystrophy. The lower diaphyseal ends of radius and ulna are rotated towards each other. Head of femur is absent, while the inner condyle is large and the outer underdeveloped.

In hereditary chondrodysplasia, multiple bony outgrowths are present in the region of epiphysis of long bones.

Rickets:—(Infantile)—There is a widening of the metaphysis and the diaphyseal ends have an irregularly serrated and cupped appearance. The cancellous structure is more open and the cortex has a streaky appearance. The bones are bent depending upon the pressure to which they are subjected and the cortex is thickened on the concavity of the bends. In syphilis, on the other hand, the thickening is all over and not confined to the concave sides, rather it is more prominent on the convexities. The flat bones show lime absorption giving moth-eaten appearance. But in the process of healing, they may become very dense and form in the skull rachitic bosses. The sternal ends of ribs are expanded and cupped.

Late rickets:—The changes resemble those found in infantile rickets. In renal rickets also there is defective mineralization of the bones as a result of an altered Calcium Phosphorus ratio. Appearance varies with the stage of the disease. The ends of bones present an appearance similar to those in rickets, but the distribution is less uniform. The skull shows a finely grained osteoporotic mottling. Later it presents a woolly appearance and thickening of the vault.

Scurvy:—The lesions are multiple, characterized by periarticular swellings. The metaphyses are widened and the diaphyseal ends show a dense opaque line called Trummer Zone. Behind this the bone presents a more or less normal appearance which contrasts with rickets. The diagnostic feature of the disease is subperiosteal hæmorrhages, which strip the periosteum away from the bone and may cause separation of epiphyses. Organisation of subperiosteal new bone at the margin of the blood-clot causes extensive shadows round the bone stimulating a new growth.

There are several other comparatively rare diseases of bones which show characteristic X-ray appearance.

Diseases of the chest.—*Heart*:—In the infant, the heart is larger in size in relation to the thorax than in the adult. This is further exaggerated in pictures taken at short distance, which sometimes becomes necessary in children, to shorten the time of exposure to a minimum. Utmost care, therefore, should be exerted before interpreting enlargement of the heart by radiogram.

In mitral disease, early cases may show no change in the appearance of the heart. The following alterations from normal are characteristic:

(1) An isolated or disproportionate enlargement of the left auricle in the right oblique view producing increased cardiac depth and "Wedging" of a barium swallow and a curve backwards of the œsophagus.

(2) Straightening and lengthening of the left border of the heart in the anterior view, due to enlargement of the pulmonary artery and conus and possibly of the left auricular appendage, and less regularly.

(3) Buttressing (extension upwards and outwards) of the right auricular curve.

(4) Increases of the hilar shadow.

In aortic regurgitation X-ray changes with well developed lesions are confined to the left ventricle and to the aorta. As a result of left ventricular hypertrophy, the left border moves farther out, or the lower and apical portions become more rounded; both these features may be present in anterior view. In the left oblique position the left ventricular arc is more pronounced and rounded than normal. The ascending aorta may be more prominent.

In congenital malformations of the heart, radiography is particularly useful and may reveal unusual prominence of one of the chambers of the heart, dilatation of the pulmonary artery, an abnormal position of the aorta or evidence of coarctation. Perhaps the most promising of all methods now being employed in the diagnosis of congenital heart disease is the radiographic demonstration of the heart and great vessels by intravenous injection of opaque substances (Uroselectan and similar compounds). The main technical difficulty in children lies in the injection of the fluid sufficiently rapid and in timing the exposure. In Fallot's tetralogy, the opaque medium, which normally shows up first the pulmonary vessels, appears immediately in the aorta owing to the latter being placed astride the interventricular septum and receiving the blood directly from the right ventricle. A right aortic arch is also found in certain types of dextrocardia. This condition can only be diagnosed with any certainty, by X-rays, which shows absence of aortic knob on the left side, projection of the aorta to the right and indentation and displacement of the œsophagus to the left during a barium swallow.

In aortic stenosis radiography reveals a large heart and a small or absent aortic knuckle.

In patent ductus arteriosus, dilatation of the pulmonary artery is the main feature (Caput of Zimm), and in severe cases the dilatation can be seen extending to the branches. Vigorous pulsation of the aorta and pulmonary artery can sometimes be made out, the atter showing "a hilar dance" (Assmann's sign).

In defects of the auricular septum, radiography reveals enlargement of the heart to the left and usually a globular outline, but sometimes a "Coeur en Sabot". The pulmonary artery is very prominent and may almost appear aneurismal, while the aortic knob is small or absent. In the right oblique view the enlarged pulmonary artery and its division will produce a definite impression on a barium filled œsophagus. Some enlargement of the left auricle may also be obvious if mitral stenosis is a complication.

In pulmonary stenosis, X-rays give a characteristic picture with the aorta projecting abnormally to the right and a concavity in the region normally occupied by the pulmonary arc. There may be a bulge on the left border below this due to enlarged conus. The apex is blunt and resembles the silhoutte of a wooden shoe (Coeur en Sabot). With a right sided aortic arch, the aortic knuckle will be absent and a barium filled oesophagus will be found lying on the left of the arch and its relationship to the aorta in the oblique position will be altered.

In Elsenmenger's complex, which is a rare condition, skiagram shows pulmonary arc as prominent, heart is globular in shape or the apex may be blunt and raised. The hilar shadows are increased and show vigorous pulsation, "Hilar dance."

In tricuspid stenosis, an X-ray picture will demonstrate a globular shaped heart and convexities corresponding to an enlarged right auricle and left ventricle.

Bronchiectasis:—This may be congenital or acquired. The most characteristic is the cystic type, in which several large thin-walled rounded cavity-like shadows are seen, or there may be a honeycombed appearance of the lung. The acquired type may be cylindrical or saccular. For accurate investigation bronchography after Lipoidol is necessary. The whole bronchial tree is clearly visualized. In plain picture, it is often difficult to differentiate between bronchiectasis and tubercular infiltration in unusual position. Also both may go together. Collapse may be present in either. Examination of the sputum and bronchography can only differentiate.

Radiography of chest has revealed that the so-called cystic lung is a much commoner disease than was suspected.

Atelectasis:—If a large bronchus is obstructed, the result may be a massive collapse. Smaller bronchii involve small portions of the lung and the radiological appearance depends upon the amount of lung tissue involved. The collapsed portion of the lung becomes void of air and therefore opaque, but the definition of the opaque shadow depends upon whether or not it is overlapped by air-filled lung. Hence skiagrams in suitable diameters are necessary.

The affected portion of the lung collapses and exerts a negative pressure on the surrounding structures. The diaphragm goes high, heart, trachea and mediastinum are retracted towards the affected side, the intercostal spaces are contracted and very soon there is compensatory emphysema of the unaffected lung. If a foreign body is the cause of the collapse, it may be seen if it is radio-opaque.

Pneumonia does not usually require radiological diagnosis. Unsuspected consolidation of the middle lobe may be revealed by a skiagram. At least two views should be taken and the differentiation is necessary between consolidation and effusion. Unresolved pneumonia gives atypical opacities.

Bronchopneumonia causes mottled opacities in the lung, difficult to differentiate by radiography alone.

Lung abscess:—Before cavitation occurs, the appearance is like that of consolidation due to any other cause. After cavitation occurs, a cavity more or less rounded and containing a fluid level is seen. It is surrounded by a zone of consolidation. The cavity and fluid level are visible in skiagrams taken in vertical position only. Skiagrams taken in lying position would obscure both the fluid level and cavity and is diagnostically useless.

Pyæmic abscesses may be multiple and small.

Pneumonitis gives the appearance of a lung-abscess which has not broken down and is atypical.

Amongst the shadows which may resemble abscess cavity radiologically, are: (1) Tuberculous cavities; (2) solitary congenital cyst with fluid level; (3) a single bronchiectatic cavity; (4) an empyema which has burst into the lung; and (5) an emphysematous bulla.

Abscess cavity shows a much more extensive zone of surrounding consolidation, but later only the fibrotic wall may remain. Differential diagnosis must finally depend upon the clinical history, sputum examination, etc., etc.

Tuberculosis:—Appearance of tuberculous lesions of lung in childhood depends upon the pathological process involved:—

A pneumonic process gives the shadow of consolidation difficult to differentiate from other consolidations, infiltration gives clusters of pin head opacities which should be differentiated from bronchovascular shadows seen end on. Cavitation shows cavity shadows with or without fibrosed walls according to their chronicity, fibrosis gives linear opaque shadows, and calcified lesions as comparatively dense opacities.

Without entering into the various forms of tuberculous lesions in childhood it may be pointed out that routine examination has revealed that tuberculosis in children is far more common than is suspected. On the other hand, the necessity of very good picture in inspiration cannot be overemphasised. We have seen many errors of interpretation, entirely as a result of bad X-ray pictures.

Further, there is considerable difference in the breadth of mediastinum and cardiac shadows in inspiration and expiration, these tending to be considerably broader if the skiagram is taken in expiration. After prolonged expiration such as occurs at the end of a cry or a whoop, the lung fields appear almost opaque and the heart shadow much enlarged, tending to serious misinterpretation such as enlarged heart, enlarged thymus, and lung infiltration. Hence the skiagram of a child's chest must be of a very good quality to permit of a correct interpretation.

A common form of tubercular lymphadenitis in children is the affection of the paratracheal gland which manifests itself as a broadened right paratracheal shadow in the superior mediastinum. The hilar glands also are often swollen and sometimes assume a very large size. After healing, the glands are seen as calcified shadows usually round-about the hila.

In *eosinophiliasis* the bronchial tree presents a finely mottled appearance. The pin-head opacities are smaller in size than that of tubercular infiltration. They tend to be generalised, but may be very difficult to differentiate from tubercular infiltration. Differential white blood cell count gives the clue.

In *pleurisy* the earliest sign is limitation of movement of the diaphragm of the affected side and the costo-phrenic angle is comparatively shallow. As the fluid increases in quantity, an advancing

triangular opacity is seen with its apex in the costo-phrenic angle and its base looking upwards and medialwards. Further accumulation of fluid displaces surrounding parts, pushing the diaphragm downwards, mediastinum towards the opposite side and the intercostal spaces become wider, but if the heart mediastinum is already anchored by pleural adhesion there may be no apparent displacement to the opposite side. Radiologically, it is not possible to differentiate between simple effusion, pus or blood. When effusion is present, there is usually some difference in the density and level of the opacity in skiagrams taken in erect and supine positions. If the effusion is encysted, this change does not take place and the opacity bulges towards the less resisting sides. Thus, if the effusion is encysted along the chest wall, the opacity gives a convex shadow towards the lung. A lamellar type of pleurisy gives a generalised haziness over the whole lung field and an opaque line of thickened pleura may be traced along the chest wall, rising from costo-phrenic angle, upwards towards the apex.

Diaphragmatic pleurisy occurs between the pleuræ covering the base of the lung and the dome of the diaphragm. It is easily recognized in the left side by the contrasting translucent shadow of gas in fundus of the stomach, but, on the right side, due to the opaque shadow of liver below, it is very difficult to differentiate between this and a high diaphragm or an upward enlargement of liver. As a sequela of diaphragmatic pleurisy, adhesions are left between the diaphragm and the under surface of the lung seen as tenting of the diaphragmatic shadow. Inter-lobar pleurisy may completely escape detection by physical examination. In X-ray photos taken in lateral projection, their appearance is typical, being a triangular or spindle-shaped opacity located in an inter-lobar fissure. Mediastinal pleurisy occurs between the apposing surfaces of the mediastinum and the lung. It gives triangular opacities lying about mediastinal border differentiated from those caused by local collapse by the nature of the associated displacement phenomena.

If empyema bursts into a bronchus, a fluid level topped by an air-shadow is seen.

Pneumothorax, spontaneous or artificial, presents a typical appearance. The collapsed lung is seen as an opacity gathered round the hilum of the lung, surrounded by the clear translucent homogenous shadow of the air in the pleural space. The displacement of surrounding parts is proportional to the amount of air present which, if excessive, as in a valvular type of spontaneous pneumothorax, pushes the mediastinum into the opposite chest and thus causes severe distress. The portion of the lung which is adherent to chest-wall does not collapse and tags of adhesion may be clearly demonstrated. When there is effusion or blood present, a horizontal fluid level is formed. Complicated by adhesions, multiple fluid levels are seen.

Mediastinum:—An enlarged thymus is seen as a rectangular shadow in the superior mediastinum. Carefully taken pictures may show pressure on trachea. Enlargement of paratracheal glands is by far the commonest cause of a pronounced shadow of the right mediastinal border. Mediastinal tumours give a rounded enlargement of the mediastinal shadow.

Digestive system.—*Achalasia* in children is easily overlooked and diagnosis requires an X-ray examination after a barium swallow.

In diaphragmatic hernia, it is necessary to differentiate it from eventration of diaphragm. It may be possible to demonstrate by barium, that it is the fundus of the stomach which has herniated through an opening in a normally situated diaphragm, that it is not the diaphragm that is high itself, and there may be so-called paradoxical movement of the fundus of the stomach during breathing.

Pyloric stenosis is shown by the retention of the barium meal.

Congenital defects or constriction at the duodeno-jejunal junction may result from pressure of superior mesenteric artery and early examination with an opaque meal and X-ray will show the food passing into the duodenum and becoming arrested.

The passage of radio-opaque swallowed foreign bodies can be easily followed by repeated X-ray examination. It is surprising to note the efficient and tactful manner in which the gastro-intestinal tract can dispose them off per via naturalis. Non-opaque foreign bodies, if sufficiently large, can be demonstrated by barium meal as negative shadows.

Ascaris lumbricoides may be seen as filling defects in the barium meal or after evacuation of the barium meal by the retention of barium in their elementary canal.

Intussusception is best investigated by barium enema, the flow of which is arrested at the advancing end of the invaginated gut and it may be possible to see a collar of barium interposed between it and the surrounding gut.

Acute appendicitis is a surgical emergency and not a province of the radiologist, but if the appendix is not immediately removed and is allowed to drift into subacute or chronic form, it often becomes necessary to investigate by X-rays. Barium is administered and the iliocæcal region repeatedly examined at frequent intervals to see if any barium enters the appendix. During the course of a barium meal, a normal healthy appendix fills and empties several times with barium. Hence no conclusion can be drawn by nonvisualization of the appendix at a single examination. Screening and establishment of a definite tenderness in relation to the appendix with local rigidity or mass formation warrants a diagnosis of an appendicular lesion. Blood examination and other physical signs are also very important. It may also be possible to show an abnormally situated appendix or cæcum. A retrocæcal appendix is better seen after the barium has cleared away from the cæcum.

In chronic tubercular peritonitis, the intestines show adhesions, by loss of normal mobility, irregular distribution of the barium and there may be a constriction of a portion of the small intestines with dilatation of the segment behind. Hirschsprung's disease is a congenital idiopathic dilatation of the colon. When a barium enema is administered enormous quantity of barium emulsion is required to fill the bowel and excessive dilatation of the bowel is seen.

In tubercular enteritis, if the lesion is of proliferating type, it is seen as a filling defect causing a deformity of the shape of the affected portion of the bowel. The filling defect will correspond to a palpable mass.

Urinary tract:—A plain picture of urinary tract shows radio-opaque calculi present in the pelvis of the kidneys, ureters, the bladder and impacted stones in the urethra. A small percentage of urinary calculi are, however, radio-translucent and have to be investigated by excretion pyelography, which visualizes the pelvis, the calyces, the ureter, the bladder and urethra. The bladder and the urethra can be studied by injecting *via* the urethra solution of Sodium Iodide. Where excretion pyelography fails, and it is necessary to investigate the anatomy of a non-excreting kidney, it may be necessary to do ascending pyelography by passing a catheter up the ureter and injecting the opaque material directly into the pelvis of the kidney. The shadow obtained by this method is much denser and well-defined than by the descending pyelography.

Ascending and descending pyelograpy makes it possible to study the anatomy and function of the urinary tract. It is possible to demonstrate abnormality, either congenital or acquired, of the size and shape, and position, the structure of the kidney, ureters and the bladder.

The presence of gas and fæcal matter in the abdomen seriously obscures a clear view of the urinary tract, and may cause serious errors in diagnosis. Hence a preliminary preparation is very necessary. A simple method is to administer plain charcoal for a couple of days, a mild laxative at night and plain enema in the morning and if necessary an injection of Pittressin or Prostigmin.

The natural path of a small stone in the kidney pelvis is down the ureter into the bladder, hence if an operation for the removal of a stone in the pelvis or ureter is being undertaken, a fresh skiagram prior to the operation is advised in order to ascertain the position of the calculus at that time. Cases have happened in which reliance was placed on a comparatively old X-ray photo and after opening it was found that the stone had shifted further down. After removal of a stone from the pelvis of the kidney, it is better, if possible, to take a skiagram on the operation table to exclude the presence of any other small calculus concealed by the shadow of the bigger one.

If such a small stone is left unobserved, very soon after the operation, it begins to become bigger and may necessitate a second operation.

It should be noted that often, immediately after an attack of renal colic excretion, pyelography may show absent secretion on the affected side, but this does not mean that the affected kidney is permanently non-functioning. Often after the removal of urethral calculus, the kidney resumes its function.

Apart from the showing of the presence of a calculus, the X-ray picture gives a clue to the size and position of a calculus and thus gives valuable information regarding whether it is likely to be automatically passed into the bladder or not and also the nearest way of approach. It should be remembered that a stone is usually smaller than its X-ray shadow.

In conclusion, it must be admitted that there are many other conditions in which the X-rays offer a valuable help, which have not been included in this article for fear of lengthening it too much. I have only made an attempt to outline the common field of investigation by X-rays. I have been particularly prompted to do this, as, in practice, cases have often come to us for investigation too late, and which, if detected earlier, would have had a much better prospect of recovery.

Staphylococcus Aureus in an Outbreak of Infantile Diarrhœa

True infectious diarrhœa caused by staphylococcus aureus in the newborn infant has been reported. In these infants large numbers of this organism were present in the fecal flora. The epidemic described by Lyon and Rantz was of this type.

Staphylococci were recovered, usually in large numbers, from the stools of seven of nine infants affected. Technical difficulties may have prevented the isolation of this organism for the one additional infant. This high rate of recovery from diarrhœal stools strongly suggests that staph. aureus was the etiologic agent of the disease. A control study not reported in the paper in detail was conducted ; in it serial stool cultures were obtained for 20 healthy babies. Staph. aureus was recovered on only one occasion by direct inoculation of feces on blood agar plates, which demonstrates that this organism is rarely present in the normal fecal flora of infants.

The disease itself was mild. Dehydration and disturbances of electrolyte balance did not occur. The diarrhœa ran its course in two to three days. Treatment with dihydrostreptomycin was instituted. This drug was used because recent reports indicate that hospital infection by staphylococcus is likely to be caused by organisms highly resistant to the action of penicillin. Such strains are regularly inhibited in vitro by streptomycin. Administration of the drug was associated with the prompt disappearance of staphylococci from the stools. The effect of this therapy could not be evaluated, since the disease was self limited. Patients who did not receive antibiotic therapy did not have a more prolonged course or severer illness.—Harvey B. Lyon and Lowell A. Rantz, *Paediatrics*, 5 : 617 (April) 1950.—*American Journal of Diseases of Children.*

SMALLPOX VACCINATION IN GENERAL MEDICAL PRACTICE

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Smallpox vaccination, as is well-known, is the introduction of vaccinia virus into the deeper layers of epidermis (where multiplication takes place most easily), for the purpose of inducing immunity to smallpox by the production of an artificial disease called vaccinia (from Latin Vacca = a cow). In smallpox, the infection is general. In properly performed vaccination, the living virus of cow-pox is deposited in the epidermis where it survives, multiplies and produces the local lesion and some general effects designated as vaccinia. After vaccination, the individual is found immune to smallpox because the virus of cow-pox has induced the production of anti-bodies which destroy and protect against the virus of smallpox.

II. Age for vaccination.—This is an important consideration.

1. *Primary vaccination* :—(*a*) An infant may be vaccinated even soon after birth but it is wise and customary not to undertake routine vaccination of infants during the first few weeks after birth. It should be done before the age of six months so as to avoid the constitutional disturbances during the period of teething and artificial feeding. General discomforts from first vaccination are usually milder in infants than in older children and adults and complications do not arise. The optimum age for first vaccination is therefore about four months. Summer months should be avoided, if possible. The first or primary vaccination confers immunity for from five to ten years.

(*b*) Primary vaccination in school children, adolescents and adults should not be undertaken except in those exposed to smallpox infection.

2. *Revaccination* :—The necessity for routine revaccination varies with circumstances, thus :—

(*a*) For children vaccinated in infancy, revaccination should be repeated about every 5 or 7 years thereafter.

(*b*) In the presence of a danger of exposure to smallpox, vaccination should be done regardless of any prior vaccination.

(*c*) Doctors, nurses, sanitary inspectors and others who are likely to deal with cases of smallpox should be protected by regular revaccinations every year.

III. Site for vaccination.—1. *Site of election* is the site originally selected by Jenner, which is the skin of the left arm in the region of the depression formed by the insertion of the deltoid muscle. The skin on the anterior surface of the forearm two inches

below the bend of the elbow, avoiding the area overlying prominent veins, may be selected as an alternative site for vaccination.

2. *Preparation of the site for vaccination*:—The skin should be cleaned by gently rubbing the selected site with sterile pledget of cotton moistened with Acetone and allowed to dry for a few seconds. The application of a highly volatile agent such as Acetone or ether is said to facilitate the penetration of the vaccine into the skin as well as has an antiseptic action on the skin. Acetone is preferred because it is cheaper than either ether or alcohol. Non-volatile antiseptics should not be used. Ordinary washing with soap and water followed by rubbing with sterile gauze soaked in three cleanings of sterile water, is also satisfactory.

IV. Vaccine material.—1. *Calf-propagated glycerinated lymph*:—This is the material widely used. The lymph should be used up within one week of the date of its manufacture which is the date of its issue from the Vaccine Institute. If, however, the lymph is obtained in ice from the Vaccine Institute, and continuously stored at refrigerator temperature it can be used up within a fortnight of its issue from the Vaccine Institute.

2. Vaccines obtained from virus cultivated in the tissues of minced chick embryo.

3. Vaccines obtained from virus cultivated on chorioallantoic membrane of developing chick embryo.

These vaccines are free from bacterial contamination and therefore being thus without the potential dangers of calf vaccine, should prove excellent vaccine but it has not yet found favour because of the limited evidence in respect of its antigenic value, duration of immunity resulting from it, its keeping properties etc., in comparison with calf lymph vaccine which has stood the test of time.

V. Methods of vaccination.—1. *Cutaneous methods*:—(*a*) *Cross-hatching* is an objectionable method which is prohibited by law in many countries. It should not be practised.

(*b*) *Linear scratch* is a convenient and satisfactory method. Skin should be prepared as described above and one small droplet of lymph should be placed upon the prepared site with a sterile needle and then a scratch one-eighth inch long made starting in the droplet. The excess vaccine may be wiped off with sterile gauze and the sleeve pulled down.

(*c*) *Multiple pressure method*:—This is the method which has proved extremely satisfactory and is particularly recommended for general adoption.

TECHNIQUE:—A small drop of vaccine lymph covering an area of about $^1/_8$th inch in diameter is placed on the skin at the prepared site. A long, straight, preferably flat-sided needle, sharp and sterile, is held parallel or tangential to the arm with the forefinger and middle finger above and the thumb below. The needle point

is next pressed firmly and rapidly into the drop about 30 times as a routine within 5 to 10 seconds. The rapid up and down motion of the needle should be perpendicular to the skin and the needle and not in the direction of the long axis of the needle. The needle point is not driven into the skin but at each pressure the elasticity of the skin pulls a little of the epidermis over the point of the needle so that the virus-bearing lymph is carried into the deeper epidermal layers. Under no circumstances must the calf lymph virus be placed subcutaneously. If the skin has not been rubbed unduly in cleaning and if pressure is entirely perpendicular to the needle, there should be no bleeding and within a few hours there will be no evidence of trauma. The excess vaccine lymph should be wiped off the arm with sterile cotton wool as soon as the pressures have been completed and the remainder should be allowed to dry.

2. *Intracutaneous method*:—For intracutaneous method the vaccine must be diluted to a fairly great extent. Results obtained by this method, using calf lymph vaccine, are in no way really superior to those obtained by the ordinary cutaneous methods. This method is therefore not in routine use. Force (1927) suggested that this method be used in cases in which the cutaneous method has failed to give either a "take" or the vaccinoid reaction of immunity. The method is also recommended for the chick embryo vaccine, the advantage claimed being that there is no external lesion and no subsequent scar formation. It is open to question whether the complete elimination of scar is desirable.

3. *Number of insertions*:—It is now definitely established that the degree of immunity is not dependant upon the number or area of the scars; large scars are often due to secondary infections. Trial should therefore be made of vaccination and revaccination in one insertion and to use no method of insertion larger than $^1/_8$th inch in any direction. A single vesicle is sufficient to protect. The important factor is the time elapsed between vaccination and exposure to smallpox rather than the size and number of vesicles.

In vaccination by the multiple pressure technique:—(1) A single insertion using "30 pressures" is enough both for primary and revaccinations.

(2) Multiple insertions using two or even three separate areas of insertion in one arm not less than one inch apart with "30 pressures" in each insertion, both for primary and revaccinations, are advised under the following conditions:—

(*a*) In case the subject is not likely to return for revaccination in the event of failure.

(*b*) In case of exposure to smallpox.

(*c*) In the presence of an epidemic or undue prevalence of smallpox.

(*d*) In case of failure of previous vaccination.

(*e*) In case there is any doubt as to the full potency of the vaccine because of possible adverse conditions of transport or storage.

(*f*) For such persons as desire to obtain the maximum protection against smallpox obtainable at one operation.

VI. Dressings.—The best dressing is the unbroken skin; dressings are therefore not only unnecessary as long as the vesicles or pustules remain unbroken, but harmful if permitted to remain on the arm. The area should rather be exposed to the air to exclude the possibility of the growth of anærobic bacilli. If, however, the vesicle or pustule breaks, or the "take" shows signs of secondary infection, the wound should be treated surgically as any superficial infected wound.

The vaccinated site should not be exposed to direct sunlight until dry. Bathing is perfectly safe throughout the period of vesiculation and pustulation if care is taken to ensure that the vaccinated area is not wetted until the formation of a firm scab.

VII. Inspection of vaccination.—1. Primary vaccination should be inspected between the 7th and 10th day after vaccination.

2. *Revaccination*:—Ideally a daily inspection until a maximum reaction is observed. Generally, two inspections are done (*a*) one on the third day, and (*b*) the second on the sixth or seventh day.

VIII. Types of reactions following vaccination.—1. *In primary vaccination*:—"*Primary take*"—Here a papule appears on the 3rd to the 5th day and the characteristic vesicle, round, umbilicate and multilocular, reaches its greatest development on the 8th or 10th day or later, and a reddened inflamed area known as the "areola" appears round the vesicle about the 7th day. Pustule appearing about the 10th day or later reaches full development by about the 12th day after which it rapidly dries, the areola fades and a scab or crust forms which should not be removed. It drops off spontaneously about the 20th day or later. It should be noted that the formation of a fair sized areola is an important event, indicating that the attainment of the maximum immunity against smallpox will not be handicapped.

2. *In revaccinations*:-(*a*) *Primary reaction i.e.* a course resembling a "primary take".

(*b*) *Vaccinoid or acclerated reaction*:—The papule appears on the 3rd or 4th day with vesicle formation by the 5th day. Pustules may be formed. The height of reaction occurs on the 6th or 7th day after which it subsides rapidly.

(*c*) *Reaction of immunity or immediate reaction*:—A papule appears within 48 hours and subsides without forming a vesicle. The

British Ministry of Health Memorandum on smallpox vaccination (1948) observes that "it is unwarranted to regard this reaction as a reaction of immunity because the lymph used may have been weakened and was unable to produce the vaccinoid or vaccinal reaction; it is also possible that such a reaction may have been due to the sensitivity of the individual to protein or other substances in the lymph and that it was not a response to the virus of vaccinia. Therefore this type of reaction should be recorded merely as 'maximum local reaction (non vesicular) on 2nd/3rd day' and if there is any doubt concerning the potency of the lymph used, one further attempt at revaccination should be made with a fresh lymph."

(*d*) If none of the above reactions occur, or if there is a delayed formation of a small papule after the 3rd day without further development, it is a negative reaction and the person should be revaccinated.

IX. Interpretation of results of vaccination.—1. *Primary reaction* is seen in those whose immunity from previous vaccinia or from smallpox has completely disappeared.

2. *Vaccinoid or accelerated reaction* indicates partial immunity from a previous attack of smallpox or a previous vaccination.

3. *Reaction of immunity or immediate reaction* is generally held to occur in persons possessing a high degree of immunity (*Cf. para VIII* (*2*) (*c*).

4. There is a common belief that failure of repeated attempts at vaccination indicates immunity. This belief is erroneous and may result in real harm. Vaccination may fail for many reasons. Cases are on record where persons were unsuccessfully vaccinated three, four or more times before a reaction was obtained. Smallpox itself does not always protect against smallpox. Louis XV of France died of a second attack. Jenner mentions a case who had smallpox five times.

5. Belief is also commonly held that if a revaccination takes, the subject was therefore again susceptible to smallpox. While this is generally true, it is also worth remembering in this connection that successful revaccination indicates loss of immunity to cowpox and not necessarily to smallpox, for vaccination gives stronger protection against smallpox than against cowpox.

X. Recording of results of vaccination.—1. *Primary vaccination*:—(*a*) When there is marked vesicle formation reaching maximum size after the 7th day, the result should be recorded as "typical primary vaccinia".

(*b*) Where the vesicle formation is absent, a second attempt should be made; if a similar result is obtained, it should be regarded as insusceptible to vaccination (I.T.V.). This insusceptibility

is not for an indefinite period. Such persons should be revaccinated whenever occasion demands.

2. *Revaccination:*—If there is no local reaction even after the second inspection, a second attempt should be made; if no reaction even then, a third attempt should be made. If no reaction after the third attempt, the result should be recorded as "No local reaction to revaccination (repeated)".

XI. Potency test of the vaccine lymph.—A useful field test for potency is that the vaccine should give more than 50% of vaccinoid reaction in a group of people vaccinated more than ten years previously or who have had smallpox over ten years previously.

XII. Complications of vaccination.—1. Generalised vaccinia.—Is liable in persons with chronic dermatosis. It is important to remember that the case fatality in generalised vaccinia is about the same as that for malignant smallpox (Ross 1940).

2. Septic complications of the vaccinated area may arise if aseptic precautions at the time of vaccination and after care of the wound are neglected.

3. *Post-vaccinal tetanus* is fortunately a rare complication which is due to the neglect of the wound and not to the vaccine lymph. Lymph prepared according to modern methods conforming to the safety tests prescribed by law is safe.

Since, however, occasional instances of post-vaccinal tetanus have been reported, it has been suggested that every effort should be made to immunize infants and children against tetanus preceding vaccination. Alum precipitated tetanus toxoid can be given at intervals of 3 to 4 weeks without interfering with the development of adequate immunity.

4. *Post-vaccinal encephalitis*:—The incubation period is ten to twelve days after vaccination. It usually follows primary vaccination and not revaccination. The condition rarely occurs in infants under one year of age but the bulk of the cases occurs in children over two years of age. Prevention lies in primary vaccination in the first year of life.

XIII. Control indications.—Vaccination is contraindicated only under the following conditions:

(1) In persons with fever and skin diseases such as eczema, unless exposed to infection.

(2) If there is whooping cough in other members of the family.

(3) In case the patient is anticipating an elective operation procedure.

(4) Other preventive inoculations such as T.A.B., anti-typhus, anti-plague, should be avoided at the time of vaccination.

XIV. Vaccination of exposed persons.—The incubation period of smallpox is twelve days: immunity to smallpox appears about the 8th day of vaccination. Therefore (*a*) vaccination done within these days of the smallpox incubation period will usually prevent or abort the disease; (*b*) if done about the 6th to 8th day of the incubation period, the vaccination "takes" and may modify the severity of smallpox, it may even then prevent or abort the disease; (*c*) if done in the last stages of incubation, it takes, but the two infections run a simultaneous course without influencing each other; and (*d*) if done during or immediately before the primary fever of smallpox, it does not influence the disease, nor does it take. Thus cases vaccinated during the last stage of incubation or just before the onset of symptoms have hardly any chance of benefiting by the vaccination. Individuals in whom the vaccination immunity is waning may contract smallpox but the disease will run a very mild course. It has already been stated above [*vide para IX* (*5*)] that loss of immunity to cowpox does not necessarily mean loss of immunity to smallpox. As, however, there is no means of judging precisely in what stage in the period of incubation a given case may be, it is advisable for the exposed persons to get vaccinated. Little harm will be done if it is too late.

XV. Quarantine.—Exposed persons should be kept under observation for 16 days from the date of the last exposure unless protected by successful vaccination performed within 24 hours of exposure.

XVI. Concurrent disinfection should be undertaken of all discharges and articles soiled with infection.

XVII. Terminal disinfection.—Thorough cleaning and disinfection of the premises are essential.

XVIII. Immunity in smallpox or cowpox.—There is no natural immunity in either. An immunity, usually permanent, follows recovery from an attack of smallpox; notable exceptions have been on record [*vide para IX* (*4*)].

XIX. Protective value of vaccination.—This is no longer a question of opinion. Statistical compilations on the point are numerous. Reports from every part of the globe now indicate that the incidence of smallpox has always been the lowest among those members of the population who have been successfully vaccinated. It is also a significant fact that doctors, nurses and attendants in intimate contact with the infection are uniformly spared because they are well protected by repeated vaccinations. Thus in considering the protective value of vaccination it must not be forgotten that revaccination is quite as important as the first vaccination which confers immunity usually only for five to ten years.

CARE OF THE CHILD IN AND AFTER FORCEPS DELIVERY

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FORCEPS delivery is becoming more common recently, and is lately more often advocated for the shortening of the labour.

Though such a common procedure it is not devoid of risks. The mortality figures even in the best recognised hospitals, where forceps delivery is conducted by trained obstetricians, is reported to be 5% to 10%. The morbidity figures are not calculated, but certainly they are much more than the mortality figures. The mortality and morbidity caused by forceps is preventable, and can be avoided or minimised by proper application of forceps in the presence of required conditions by experienced persons. The subject is worthy of inclusion in the larger programme of 'Infant Mortality Reduction'. The subject needs a careful study and thorough observation to arrive at the esteemed aim of minimising the morbidity and saving all the children after forceps delivery.

Low forceps, when indicated, may be undertaken without apprehension, if accoucheur possesses ordinary obstetrical ability. Mid and high forceps should be performed by the trained obstetrician. If possible, even the skilled operator avoids high forceps, and hesitates unless definite indications are present to apply blades at the level of spines. When all the eventualities are weighed the forceps delivery is properly called a 'major operation'.

It is well known that the high forceps is more likely to cause injury to the child, and the damage to the child would be more in premature ones and in mothers having contracted and deformed pelvis. Even the more benign use of low forceps may result in similar damage if applied in unfavourable conditions, such as—

(1) Extraction through the incompletely dilated cervix or through a rigid outlet without resorting to the clearly indicated episiotomy.

(2) Erroneous diagnosis of position with abnormalities of pressure resulting from improperly applied forceps blades.

(3) Forcible delivery through a contracted pubic arch not properly compensated by an adequate posterior sagittal diameter.

(4) Forcible and rapid extraction from any cause in contrast to a studied and unhurried delivery.

Injury would be more in children who had undergone labour for a longer duration and also those who had relatively large birthweights.

Altered fœtal heart sounds in the second stage of labour are often due to compression of the brain which may be intensified by forceps delivery.

These forceps injuries are, thus, the product of the labile and variable passenger in a fixed unyielding passage. The pelvic factor also plays an equally important role in this complex. The pelvic immobility is more noticed in its joints as the age advances.

Superficial injuries on the scalp and the face do not result into any pathological changes. Sometimes very few might get infected and result in necrosis and scarring. Fractures and bony injuries lead to intracranial damage which is of great pathological interest. The cushion of the cerebrospinal fluild permits wide mobility of the cranial contents but the injury ensues when the application of the forceps suddenly overtaxes the contents. The resulting lesion is a contusion, concussion, edema or vascular rupture.

The septa of the duramater are regarded as ligaments of the bones of the vault. They restrain excessive alteration of the shape of the head during labour. The injuries to the tentorium result from lateral pressure by forceps application, whereby the antero-posterior diameter of the head tends to a compensatory elongation. The longitudinal fibres of the falx cerebri swing across the tentorium on each side, and this point of junction is the weak point of the system. The triangular area in the junction of the falx cerebri and tentorium is damaged in over 92% of deaths from cerebral hæmorrhage. The compression of the occipitofrontal diameter tends to elevate the calvarium with direct strain upon the falx and tentorium. This happens when the forceps is applied anteroposteriorly. The blood vessels which tear and are the usual sources of intracranial hæmorrhages are the veins of galen and its tributaries.

Tears of the falx and the tentorium are almost immediately followed by subdural and ventricular hæmorrhage. This damage is found in 40% to 50% of all cases of intra- and post-natal deaths. Sometimes the pressure of forceps might bring only congestion and rise of intracranial pressure, leading to the interference of the blood supply of the respiratory and other centres in the brain stem, producing a state of intra-uterine and post-natal asphyxia of the fœtus.

The care of the child should start from giving injection of Vitamin K 10 mgms. to the mother during labour to raise the prothrombin level in the blood of the child.

While extracting the child with forceps continuous pressure should never be applied but the blades should be released and unlocked at intervals. Axis traction is practically never used even in mid- and high forceps. The handle of the blade should be covered by sterile towel and traction applied by Pajot's method. The bladder and the bowel should be evacuated.

After extracting the child with forceps, when the head is crowned, injection of Lobeline (mild) or Coramine should be given as a routine, in the scalp or caput to avoid anæmia and asphyxia of the brain and further maleffects. The blades should, then, gently

be removed in the reverse order of their application to avoid injury to the child and the mother. The delivery may be completed by the upward pressure of the fingers of the right hand or with the the palm of the right hand enveloped by a sterile towel, exerted between the anal orifice and the tip of the coccyx. The head may, then, be allowed gently to extend at the end of the pain. The edges of the vulva are slipped over the face and the chin during the interval. Once the face is out, delivery should be allowed to progress by natural forces only.

When the child is delivered and if it is in a healthy condition the pulmonary respiration is established almost immediately and after a few ineffectual gasps the child cries lustily. The child should be handled as little as possible, and violent attempts to stimulate respiration must always be avoided. Oxygen should be given until respiration becomes normal and infant comes in good colour. It is best administered by a small No. 4 catheter in the nose or in the mouth.

The obstetrician should then look for any injuries to the scalp, the face or the bones and examine the child carefully. The usual bath should not be given, but the child should be kept as quiet as possible and after oiling all over with warm olive oil should be wrapped in cotton wool or warm blanket and should be carefully protected by hot water bottles or bags. The room should be quiet, properly ventilated and the cradle should be shielded by screen to prevent draughts. Injection of Gardenal Sodium ¼ c.c. or ¾ of a grain and aqueous vitamin K^{10} mgms. *i.e.* Synkavit 1 c.c. should be given to all the children after forceps delivery as a routine, to prevent the damage caused by small intracranial injury which often occurs in forceps application. Bromide mixture should be given for the first 2 days as a routine. For the first 24 hours it is best to give no food whatsoever to the child. Even fluid is not to be allowed. The child should be left undisturbed as far as possible. Three feeds at 8 hourly interval may be given during the next 24 hours and subsequently regular feeding may be commenced.

The oxygen should be continued for a longer time. The respiration and the colour should be carefully watched, and when it is maintained for a sufficiently long time then only it should be stopped. The rate of flow should be about 1 bubble per second through water. The oxygen from the cylinder should pass through a Woulfe's bottle standing in warm water so that it will reach the infant moist and warm.

All unnecessary handling should be avoided. The infant must be carefully weighed every day, 4 hourly temperature chart should be kept in order to know and promptly deal with the fluctuations of temperature. In the first few days the nurse-in-charge should be instructed to watch for weakness in sucking power, drowsiness, twitchings, cyanosis, temperature, yawning or marked diminution of weight. These children should be kept in the Nursing Home

for observation until one fortnight. I had one child under my observation who showed twitching and cyanosis on the 11th day and could be promptly diagnosed and treated successfully.

Bony injuries are rather uncommon. The posterior half of the parietal bone, or rarely the posterior part of the frontal bone, may show depression or the depressed fracture of the bone. The forceps blades play a contributory part in forming these depressions, when the head is pulled down in contracted or flat pelvis against the sacral promontary. No treatment is required because the bone gradually rises into its proper position by itself or a little lateral pressure is enough to set it in correct position.

Very rarely fractures of skull bones have been noted after difficult forceps delivery. These are the flat bones and because of incomplete ossification fracture takes place in the radial line of ossification. They rarely show displacement. Whenever an actual break in continuity occurs cerebral injury is from hæmorrhage. Oedema or direct pressure is almost inevitable whether or not it produces recognisable symptoms. Consequently, the treatment would be the same as for intracranial injuries. Some cases of the fracture of the occipital bones have been reported, wherein weak union between the squamous and the lateral portions permits the separation under the stress of difficult labour. The injury can be largely prevented by careful cephalic application of forceps and by the avoidance of undue pressure of the occiput against the symphysis pubis. Intracranial injuries play an important role.

Extensive haemorrhage:—Extensive subdural or intraventricular hæmorrhage usually causes stillbirth. A few of these infants do survive for a short time. They are born in a state of white asphyxia from which resuscitation is usually difficult and they usually show subsequent unmistakable symptoms. They show frequent attacks of cyanosis and the respiration is irregular and shallow. Rigidity of the limbs, localised twitchings of face and eye or generalised convulsions might also be observed. The sucking reflex is absent. The child might be in coma or on the other hand might be restless and crying. The lives of these children are very precarious and they seldom survive more than a few hours or days. No treatment is likely to be effective. Lumbar puncture seldom produces any appreciable effect and can do no more than prolong life for a little while.

Slight haemorrhage:—These cases can mostly be saved. They show very few symptoms and therefore need constant observation. For days together the child might remain normal and after a few days might show occasional twitchings or attacks of cyanosis. Weakness in sucking power, drowsiness or even yawning might indicate the lesion. Lumbar puncture and careful examination of infants with suspicious symptoms would probably bring to light more cases of slight hæmorrhage.

Maintenance of perfect quietness is necessary so that thrombosis might take place to best advantage. The external application of heat is necessary to sustain the body temperature. The infant should be handled as a case of a head injury, should be kept in upright posture, and 10 mgms. of Vitamin K should be given and repeated, if necessary. Lumbar puncture should be done repeatedly with a view to freeing the subarachnoid spaces and preventing them from becoming matted. Cerebral œdema and congestion might be relieved by giving 2 to 3 ounces of 10% saline solution by the rectum. The twitchings may be controlled by the use of Chloral Hydrate in doses of half grain or Dormel liquid in doses of 5 to 10 drops 4 hourly by mouth. Oxygen should be given continuously and Gardenal Sodium may be repeated if necessary.

After studying all these injuries we can judge that almost all these children can be saved and morbidities minimised if proper care is taken. All minor injuries get completely recovered, and even intracranial injuries are frequently followed by permanent recovery. In cortical contusions in which the lesion consists of essential hyperæmia, œdema or a series of punctate hæmorrhages, recovery is more prompt and definite.

Involvement of the brainstem directly or secondarily always renders the prognosis grave. Convulsions which give way to paralysis often signify irreparable tissue damage, but recovery is not unknown. The occasional case may also succumb to secondary changes involved through local infection or constitutional disease.

It is uncertain but some cases have been reported with permanent aftereffects, the chief of which are the spastic paralysis of limbs, monoplegias, hemiplegias or unequal spastic diplegia. The mental development of such children may also be affected.

In conclusion it can now be said that forceps application should be carried out after allowing sufficient time for the head to mould and descend into the pelvis. X-ray pelvimetry should be taken to help to measure the pelvic diameters in difficult cases. Persistent occipito-posterior position should not be mistaken or overlooked. Feeling the ear or the nape of the neck is a good guide to diagnose it. The dilatation of the cervix should be complete between pains before forceps is applied. If fœtal distress is evident before full dilatation, it is always possible to complete the dilatation manually and then the forceps can be applied. Episiotomy is an absolute indication in primipara and in multipara with persistent occipito-posterior position, mento-posterior position, and for the aftercoming head in breach presentations. Mid- and high-forceps should always be handled by trained and experienced obstetrician. The low forceps should be clearly and strictly defined as the application of forceps when the head is visible, the skull and not the caput is on the perineal floor and the sagittal suture is in the antero-posterior diameter of the pelvis.

BIRTH INJURIES

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THE subject of birth injuries has been selected for discussion because most of these mishaps can be very well treated by general practitioners. The injuries may be trivial, moderate, or it may be even so grave, as to produce a stillbirth or fatality after birth.

These injuries are classified into three heads :—

I. Injuries of external parts.
II. Injuries to nerves.
III. Injuries to bones.

I. Injuries of external parts.—1. *Caput-succidaneum* :—It is physiological and is nothing but an œdematous swelling which forms normally in the soft tissues over the presenting parts of the child's head and it is of no pathological importance. Occasionally a cephal hæmatoma is concealed underneath. No treatment is necessary. It disappears within two or three days—hardly a week.

2. *Cephal haematoma* :—While caput-succidaneum is superficial, cephal hæmatoma is deep, underneath the periosteum, and so the physical signs are different which makes its diganosis easy. Cephal hæmatoma is an extravasation of blood underneath the periosteum limited to the area bounded by the neighbouring sutures and is due to the pressure on the skull and scalp at birth. It may develop after spontaneous delivery but usually it occurs during forceps delivery or in extraction of the breech especially when there is some disproportion. The most common situation is one or both parietal bones as they are common presenting parts. However it can occur on occipital or one of the frontal bones. As against caput-succidaneum, which is always present at birth, cephal hæmatoma may not be present at birth but develops a few hours or even one or two days after delivery. It is chiefly of interest because it tends to persist in some cases for as much as two or three months and causes anxiety to an anxious mother who has probably a first child after great longings. While caput is not well circumscribed, may be present over more than one cranial bone, and pits on pressure, cephal hæmatoma is sharply limited by sutures to a particular bone, not pitting on pressure, and is elastic.

Treatment of cephal haematoma :—Cold compresses and a firm pad application is all that is necessary in early cases. Later no dressing is needed. It should not be incised or aspirated for the danger of infection. No permanent defect results and the swelling gradually disappears. The treatment really is of the anxious mother and not of the child.

3. *Haematoma of the sternomastoid* :—This occurs in the process of delivery of the shoulders and is probably due to the rupture of some muscle fibres and vessels due to overstretching. A blade of forceps may deeply crush the muscle and lead to myositis. It appears a few days after birth, as a lump about the middle or the

lower third of the sternomastoid, and even torticollis may be seen. Child cries on handling.

The treatment is simple. The child should be placed to lie on the affected side, to produce counter stretching. Complete recovery occurs as a rule.

4. *Rare external injuries*:—Some of these are bruises and lacerations, injuries to eyeball, injuries to the throat and soft palate. They are due to faulty application of forceps and faulty manipulations with fingers.

II. Injury to nerves.—1. *Erb's palsy*:—This is due to injury of the brachial plexus and is due to excessive traction on the brachial plexus during the delivery of the shoulders. The injury is to the 5th and 6th cervical roots. The action of the 5th and 6th cervical nerves is abduction of the shoulder flexion of the elbow and supination of the forearm. These actions are naturally paralysed and so the opposite muscles get an upperhand. Therefore the arm is abducted, the elbow is extended and the forearm is pronated. As a result of this the limb assumes a characteristic position which is known as the position of 'Policeman's Tip.' Sensations remain normal but muscles atrophy quickly. The prognosis is favourable in a majority of cases because this is due to bruising and compression by the exudate as a result of overstretching.

TREATMENT.—The treatment is evident. The paralysed muscles should not be overstretched by the non-paralysed muscles because otherwise when these muscles regenerate they will not be able to act properly because of overstretching. Therefore the limb should be put in a position of rest *i.e.* the arm is put in abduction at right angle from the trunk, the elbow in flexion, the forearm in supination and the wrist in dorsi-flexion. Usually 'Fairbank's splint answers well the purpose.

PROGNOSIS.—All the slight injury cases recover in the course of a few weeks. However about 15% do not recover and need an open operation of suturing the nerve. This operation is not very easy. It is difficult to identify the cut ends. The results are not very satisfactory.

One of the rare paralysis of brachial plexus is *Klumpke's paralysis* in which the 8th cervical and 1st dorsal roots are injured. The treatment is on the same principles.

2. *Facial nerve palsy*:—This is about the most common nerve injury. It is due to false application of the forceps during delivery. In most of the cases recovery is seen within a week. No treatment is necessary. Very rarely the facial palsy is due to intracranial injury in which the facial nerve is involved. In this case the paralysis may be more permanent.

3. *Radial nerve palsy*:—This occurs because of the special lie of the nerve for compression, as it has a long course and due to its close relation with the bone humerus. The deformity of wrist-drop

is wellknown. It is peculiar that there is only motor paralysis although the nerve is a mixed one. The sensory and the vasomotor fibres escape compression effect. The nerve is injured sometimes during fracture of humerus. Keeping the arm in 'cock-up' splint is the treatment. The results are satisfactory.

III. Injury to bones.—The injuries in order of frequency are :—(1) The fracture of the shaft of the humerus.

(2) The fracture of the shaft of one or both clavicles.

(3) The fracture of the shaft of the femur.

(4) Depressed fracture of the skull.

(5) Displacement of the epiphyses of the humerus or femur.

(6) Fracture of the lower jaw.

The fractures are seldom of the greenstick type. They are usually complete, and there is often considerable displacement. Large masses of callus develop, and after one or two weeks a lump is formed, which suggests injury to the bone. Prognosis in these fractures is excellent, because non-union is practically unknown. Union is rapid. Even if bone unites with angulation, gradual moulding occurs in the first few years of life, and normal alignment is restored. However, shortening may persist into adult life. With proper care during delivery, none of these fractures should really occur, as they are due to faulty technique.

1. *Fracture of the shaft of the humerus* :—This is due to wrong attempts to deliver the extended arms in breech presentation or to deliver impacted shoulder in vertex presentation. The common site is the middle third of the bone. The fracture is transverse or spiral. Over-riding is rare. The deformity is of outward angulation, as the powerful deltoid muscle abducts the proximal fragment. Radial nerve palsy may be produced. Callus formation is considerable. *The diagnosis* of fracture is easy. The arm lies hanging by the side, and there is inability to move the arm due to tenderness and pain. If, in doubt, radiography will prove the diagnosis.

TREATMENT.—This is simple. The arm is strapped to the chest over a pad of wool, which is thick enough to maintain moderate abduction of the limb. The hand and fingers are left free. Even if the fracture unites with some angulation, there is no cause for worry, because the angulation will be corrected by gradual moulding within the first two or three years.

2. *Fracture of the shaft of the clavicle* :—This occurs in the middle third of the shaft and in majority of cases it is due to direct digital pressure on the bone during delivery of the after-coming head. Occasionally it occurs indirectly from traction on the arm or the head. The outer fragment is displaced downwards and inwards, while the inner fragment is displaced upwards, by the pull of the sternomastoid muscle. The injury often becomes evident only by a lump due to callus formation two or three weeks later. A pad of gauze in the axilla tries to put the outer displaced fragment in a line

with the inner fragment. The arm is kept in a sling for two weeks. The results are quite good.

3. *Fracture of the shaft of the femur* :—This is produced by traction on the leg in breech delivery, but is usually due to efforts to deliver a breech with extended legs, by groin traction, or by bringing down legs first. Injury may also arise during extraction of the child by cæsarean section. The fracture is in the upper shaft of the femur. The proximal fragment is strongly flexed by the psoas muscle and so itusually lies at right angle to the distal fragment. The attitude of the child with this fracture is one of general and strong flexion because of the tonic contraction of the psoas muscle.

TREATMENT.—Fixed skin traction is applied to both the limbs flexed at the hip and extended at the knee. I usually do fixed skin traction with the overhanging transverse par in the middle of the frame of the child's cot. The traction applied is just sufficient to keep the buttocks slightly raised from the bed. By this treatment the distal fragment comes in apposition with the proximal flexed fragment. Nursing is easy, and no difficulty from pressure sores occurs. This is kept for four weeks. Result is excellent.

4. *Depressed fracture of the skull* :—This is due to pressure of the child's head on the bones of the pelvic inlet, particularly the promontory of the sacrum especially in contracted pelvis. It is a rare injury because of the pliability of the skull and wide open sutures in the infant. Depressed area of the bone often undergoes spontaneous elevation. If it fails to do so, operation is indicated. Operation is usually easy. Through a small hole at the bottom of the depression, the bone is brought into position by means of a hook.

5. *Epiphyseal displacement* :—Birth injuries may cause displacemeut of the epiphysis at the lower end of the femur, the lower end of the humerus or the upper end of the humerus. These injuries are rare. They are treated by ordinary manipulation and immobilisation for three weeks. Even if the displacement remains imperfectly corrected, the regenerative powers of the infant are such that an apparently normal bone is reconstructed and no deformity remains.

6. *Injury to the lower jaw* :—This injury is very rare and the treatment is on ordinary lines.

Sometimes multiple fractures are seen in an infant. In this case *congenital fragility of bones e.g.*, osteogenesis imperfecta should be suspected.

The reader must have noticed from the above discussion, that the birth fractures unite very quickly. But there is one exception and that is the fracture of the tibia near the junction of the middle and the lower third of its shaft. This fracture is rare but is very difficult to unite because of the feeble blood supply and the difficulty of immobilisation in infants. Slow union or even non-union occurs, giving rise to pseudo arthrosis. There are various views as to the causation of *pseudo arthrosis of tibia* but the one mentioned above is probably widely accepted. The treatment is open operation and internal immobilisation by double onlay grafts.

IMPORTANT POINTS ON FEEDING

R. L. TANDON, M.D., D.S.,
Paediatrician, Dr. Tandon's Children Hospital, Hauz Qazi & Kingsway, Delhi.

MAJORITY of the patients who come to the hospital suffer from ailments which are directly or indirectly connected with the error of feeding. The important points regarding feeding are the following:—

1. Put the child on breast from the 1st day, no matter the milk comes or not, for a couple of days.

2. Give milk every three hours starting at 7 a.m. and ending at 10 p.m. No milk is to be given at night between 10 p.m. to 7 a.m. even if the infant cries. Give sips of warm water after each feed and at night if the infant wakes and cries.

3. Some mothers give their own milk off and on, in addition to artificial milk on the plea that the child feels hungry on breast. This mixture of milks is more injurious than putting the child on any one of them and so should not in any case be allowed.

4. Feed the child from both the breasts at each feeding from 5 to 10 minutes at a time. Give a little warm water after each feed.

5. Let the child be fed on breast for one year, the maximum.

6. Some mothers feed their babies on breast for more than one year and I have come across cases where feeding is continued for 3 to 5 years or longer, specially in rural areas, by uneducated persons and also by some persons on the plea that they can avoid pregnancy. This spoils the health of the child and mother and the notion of avoiding pregnancy is wrong. So breast feeding should be stopped by ten months to one year.

7. Most of the mothers, due to health or other causes, think that suckling is impossible and start straightway artificial feeding which should be discarded as it is injurious to child as well as to mother.

8. Failure to gain weight is the only justification for weaning in early days of the baby.

9. After 10 months to one year reduce the milk and replace some feedings by vegetable soup till the end of one year when the child is put on artificial milk.

10. After one year give only milk in the morning, midday and night diluting the milk to 1 : 3 to start with, adding little glucose. Give in between, vegetable soups and fruits.

11. Give only buffalo's milk for two years at least. No cow's milk is to be given to any child up to the age of 3 years to avoid bovine tuberculosis, or if buffalo's milk is not available put the child on Glaxo, Oster milk, Similac, Varamel, white house vaporated milk.

12. Don't give any medicine as tonics to the children. It is useless and even harmful to give vitamin A and D to infants so long as they are taking milk in any form, because this overloads the cells of liver causing various types of dyspepsia to the limits of producing cirrhosis of liver. Moreover, these things make the child flabby, not healthy. The infants require other things which are not available in milk diet like Vitamin B complex, Liver Extract. So these things may be introduced to a small extent.

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SCREAMING IN INFANTS

M. B. PRABHU, M.D., M.R.C.P.,
Madras.

Definition.—A scream is defined as a sharp shrill cry of fear or pain (Webster).

It will be noticed that screaming is different from crying. A scream starts suddenly; the voice is high-pitched and usually creates an impression that there may be something seriously wrong which requires urgent attention. A scream is far more un-nerving to hear than a cry.

Since the subject of this article is an infant, that is, a child up to two years of age, it will be evident that it cannot tell you what is amiss. Very often the physical signs are so few, sometimes so slight, occasionally almost absent, that it causes the attending physician a sense of embarrassment when he is face to face with a case that requires immediate handling but which gives so few clues for a rational management of the case.

We can take here some of the causes which are not usually considered pathological. Screaming in a healthy infant may be as a result of fright, taking place more readily in a child of nervous temperament. This cannot be considered strictly pathological. However, the object causing fright should be removed. It may be a sudden loud noise or some object the child is not familiar with.

Increasingly often it is a sign that the child is clamouring for attention or that it is frustrated in what it desires. Here the screaming is a sign of naughtiness and is more common in the petted and pampered child. Though screaming as such, does not need to be taken notice of, nevertheless it should be interpreted as a sign of emotional instability. The child likes to dominate the household by its cries and it insists on what it wants whether it is beneficial to it or not. Firm handling of the child, no notice being taken of its screams, and attempts to divert the child's attention to things that are pleasant, will bring about an improvement in the child's behaviour. If this behaviour pattern is not corrected in time, feeding difficulties will arise which, in their turn, may lead to ill-health and disease.

In a large number of cases the cause lies in the abdomen; usually it is some disorder of digestion associated with a certain degree of flatulence. The pain is of a colicky nature and is due to spasmodic contraction of the bowels. An enquiry into feeds is essential. In the majority of cases the child is on artificial feeds. Sometimes the artificial food adopted is one of good reputation—nay, wide reputation. This need not necessarily mean that it cannot cause indigestion in the child in question. The child usually lies with its legs drawn up. When you gently palpate the abdomen there is no increase of pain and on percussion there is tympany. The motion, on inspection, shows evidence of milk curds. A glycerine

enema and warm fomentations applied to the abdomen are helpful. The drug of choice in my experience, has been Liquid Paraffin 8 to 10 minims in a little warm water, as a suspension—not an emulsion—administered once in two hours or earlier has given greatest relief. In many cases simple carminative suffices, but in the cases referred to here, the parents had already tried the common carminative patent remedies and because these had failed the child was brought to the consultant. After the screams are relieved a detailed examination should follow. It should include a complete examination of the urine and motion to get a complete picture of the case with a view to ward off similar attacks of screaming in the future.

Another frequent cause is ear ache. This usually follows naso-pharyngeal catarrh and the usual history is that the baby had slight fever, cold, running from the nose; the child looked slightly ill: home remedies may or may not have been administered as the ailment appeared trivial. Then all of a sudden—usually at night—the child begins to scream. In a few cases the mother has noticed that when the ear was pressed in the course of handling the child, it had cried. I have an impression that this kind of intermittent ear ache is more common in mild types of naso-pharyngeal catarrh than when the child is severely ill with pneumonia. Ear ache should be suspected in each case, warm ear drops should be instilled in each ear and a sedative mixture given internally for the cold, the causative factor.

Some other causes:—Localized areas of acute inflammation, as a commencing abscess, cause fever and pain and when the part is handled carelessly the child simply screams. It is surprising how a mother of several children will bring an infant with a large abscess on the buttocks or back of the shoulders, handling the baby in such a clumsy manner that the abscess gets pressed upon and the child screams. It does not occur to her to keep a bit of folded cloth to protect the area from such a pressure.

A healthy child, breast-fed, often the first one, generally a male, may be brought to you screaming. The child has been passing almost pure blood or blood-stained mucus in the stools, thus simulating an attack of dysentery. Between the screams the child is quiet. At times nothing definite may be found on examination of the abdomen. Where the diet and the care of the infant are above reproach, consider the possibility of intussusception before you decide to prescribe a purgative.

If the child screams almost from birth at the time of micturition and the child is male, examine the infant for phimosis.

If the child screams on passing urine where it was not usually doing so before, the possibility of excessive acidity of urine and of pyelitis should be borne in mind.

Sometimes a strong and well-nourished infant strains and screams while passing motion. The history is one of constipation

that is, of a motion once in a day or two. As a result of constant straining there may be an umbilical hernia. But to one's surprise the motion is not hard as one expects in constipation but rather soft and semi-liquid. I have seen convulsions follow such screaming with straining. In my experience these have been cases of over-action of the anal sphincter. Dilatation of the sphincter with the little finger brings about an immediate cure, and, what is more surprising, a lasting cure.

Some obscure causes of screaming:—A first-born child was brought for incessant screams by night. On examination it looked healthy and there were hardly any signs of any hereditary defect or disease. It was breast-fed. On careful enquiry it was discovered that the mother had syphilis for which she had received inadequate treatment. On administering small doses of mercury in the form of grey powder the screaming attacks ceased. This was in the pre-Penicillin days.

A child screams constantly more or less from birth. The history may reveal that the child had been rather slow. There was delay in holding up the head erect. On careful examination the baby exhibits signs of amentia. It may have a small head or does not recognize or fix its gaze when a bright light is focussed on the eye. On passive movement of the extremities a certain degree of jerkiness and spasticity are noticeable. Here the cause is congenital maldevelopment of the brain and sedatives have to be given.

In inflammation of the brain or the meninges, screaming is naturally to be expected as a prominent sign. Curiously enough, it is not so common. In tuberculous meningitis it is supposed to be one of the classical symptoms. In my cases it has been present in only about 10%.

In the course of a fever, just before an impending convulsion, screaming may often occur.

Another cause of screaming in a child that has been previously normal, subsequent to an attack of fever, is encephalitis lethargica, when this may be regarded as a form of sequela.

If a child suffers from a chronic illness often associated with diarrhœa and is brought in looking emaciated, pale with a waxy complexion, and with a long-drawn pinched face, crying day in and day out, as if it is in severe pain, it is a case of frank or latent scurvy. If 100 mg. of Vitamin C are given intramuscularly, the relief is immediate and dramatic. If this possibility is not remembered, all the other methods of treatment fail to give relief.

A few children, in good health, and without any sign of disease, may scream and then go into a convulsion. The possibility of infantile epilepsy should be borne in mind.

In conclusion it is to be understood that this is not a complete survey of screaming, but rather a short essay to draw your attention to some features worthy of remembrance.

4, Gengu Reddy St.,
Egmore, Madras.

THE COMMONER FORMS OF DIARRHŒAS IN CHILDREN

M. M. CHATTERJI, M.B., B.S. (Cal.),
Medical Officer, The Tata Iron & Steel Co., Ltd., Calcutta.

K., aged 1½ years, the only child of a widow, with the complaint of a large number of watery motions with green flakes of mucus and undigested food particles was seen on an emergency call with a complete picture of toxæmia and dehydration. The eyes were sunken, the nose was pinched and the whole body assumed a peculiar ashy colour. The skin was shrivelled up and the extremities were cold and clammy. The child was crying feebly in a sunken voice with a depressed ant. fontanalle. The pulse was quick, thready and almost imperceptible.

The child started this malady with the 'H' of irregular loose motions about a fortnight back and to start with there was vomiting associated with slight fever off and on. Later on gradually the diarrhœa became worse from day to day and the vomiting at the highest peak of the illness was almost incessant. So much so, that even sips of water were not to be retained.

Now let us take another very common form of diarrhœa, so frequently met with in the medical outdoors. The child usually coming of low income family is brought with the 'H' of a chronic diarrhœa of long standing (say about 6—8 months) and œdema over the whole body but more marked on the lower limbs. Such cases are frequently associated with a generalised dermatitis or may present the typical pellagroid lesions of the skin. It is the bloated up appearance of the child that possibly makes the parents feel about the urgent need for medical aid.

Now I am sure that my colleagues will bear me out, when I say that the pictures painted above, represent two different types of diarrhœa in children. One popularly known as summer diarrhœa and the other diarrhœa of nutritional origin, both being encountered commonly in our day to day practice and they are at times very bad emergent cases in pædiatrics.

This brings in the problem of the commoner forms of diarrhœas in children, which may conveniently be classified etiologically, under the following heads:

DIARRHŒAS IN CHILDREN

(A)	(B)	(C)
Dietetic	Infective	Diarrhœas due to deficiency or avitaminosis *e.g.* celiac syndrome, pellagra, avitaminosis A, etc.
1. Fatty diarrhœa	1. Parenteral	
2. Carbohydrate „	2. Enteral.	
3. Allergic „		

A. Dietetic diarrhœas.—Under this broad heading are included the various gastric disorders of children which can directly be attributed to the quality of their feeds.

1. A child accustomed to mother's milk if suddenly changed over to undiluted cow's milk feeds may react by developing whitish vomiting and watery motions containing lots of white curds. Such cases are usually associated with severe griping pain. Thus sudden weaning, specially in the summer, when the bacterial infection factor is at its optimum, should be discouraged. This type of fatty diarrhœa is due to the failure, on the part of these tiny beings, to cope with the sudden increased demand on the secretion of the pancreatic juice to split off the excess amount of fat particles in the altered diet. As a result, the intermediate products of fat metabolism *viz.* the pyruvic and the other organic acids are produced which by increasing the intestinal peristalsis give rise to fatty diarrhœa.

2. Another very common form of dietetic diarrhœa in children is what is commonly known as carbohydrate dyspepsia where, due to an imbalanced diet, the child gets a plentiful supply of feeds, rich in carbohydrate, so much so, that the gastric ferments fall inadequate and, as a result, food particles enter the intestines almost undigested. A fermentation reaction is being initiated by the intestinal bacterial flora, by which the carbohydrates are changed into lactic acid and oxalic acid which by irritating the intestinal mucosa produce frequent watery motions. The associated gas formation explains the frothy appearance of the stool, which has got a characteristic pungent, sour (acid) smell. Its irritant nature is often manifested by the formation of small sores round about the anus.

This sort of malady is mostly seen amongst children of the poorer class who are hardly provided with a proper well-balanced diet. The main article of food in such cases usually consist of some cheap form of cereal like barley adulterated with flour and powdered rice or shotti food (a rich carbohydrate feed). Milk is more or less a luxury food to them. Such fermentative diarrhœa of some duration tells heavily on the general health and growth of the child and an ultimate result is the development of nutritional œdema owing to further depletion of body proteins.

3. There is another form of dietetic diarrhœa, where the child is sensitive to a particular item of food, usually to some protein factor *e.g.* egg protein or milk protein and reacts violently to the respective allergens in the form of loose motions associated with colic, vomiting and other allergic manifestations. These allergens may also reach the gastro-intestinal system of the child through the mother's milk when the mother has taken any such item in her food.

B. Infective diarrhœas.—1. *Parenteral type*:—It is a type of diarrhœa where the site of infection is situated outside the gastro-intestinal tract, the latter being influenced reflexly or *via*

circulating toxic metabolites, as in:—(*a*) Acute infective fevers like measles, broncho-pneumonia, bronchitis etc.; and (*b*) suppurative conditions like mastoid abscess, suppurative tonsils, pyelitis, multiple furunculosis, empyema etc. etc.

2. *Enteral type*:—Here there is some form of bacterial invasion of the gut, specially by the Salmonella group of food-poisoning bacteria. Such invasion is possible on account of low gastric acidic content. The rate of child mortality and morbidity from this condition is rather very high in the summer and, as such, the condition is also known as summer diarrhœa.

According to the severity of the degree of infection, the summer diarrhœas may again be subdivided into:—(*a*) Simple diarrhœa; (*b*) febrile diarrhœa associated with mild fever and slight toxæmia; and (*c*) choleraic diarrhœa, where the signs and symptoms of toxæmia and dehydration are very, very grave, and these cases if not tackled early usually end fatally.

C. Diarrhœas due to deficiencies and avitaminosis.—Under this heading, in our country particularly, avitaminosis in the different forms is to be regarded as the etiological factor.

Vitamin A deficiency is a frequent cause and beside enteritis, ocular lesions like xerosis of the conjunctiva and keratomalacia and cutaneous lesions giving rise to a characteristic "toad skin" are also met with.

In cœliac syndrome probably Vitamin B complex deficiency has its part to play. Avitaminosis D is also responsible in certain cases where defective bone formation is a feature.

Treatment of diarrhœas in children will obviously depend on the etiological factor but primary consideration will be due to the immediate reaction of the child to the diarrhœic state and its severe aftereffects.

The immediate reaction is in relation to the fluid loss from the system together with the electrolytes. The total fluid content of the tissues in a child is comparatively more than in the adult, in proportion to the solid components. Besides, loss of alkaline intestinal contents together with a starvation metabolism account for acidosis developing in the system. The important aftereffects specially of long-continued diarrhœa will be hypo-proteinæmia with varied degrees of degenerative changes in the liver and nutritional œdema. These effects have got to be counteracted before or at the same time, that the etiological factor is tackled.

Thus the principle of management will be as follows:—

(1) In acute diarrhœa. (2) In chronic diarrhœa.

1. *In acute diarrhœa*:—(*a*) Replacement of body fluids.

In cases of severe toxæmia and a marked dehydration—

An intravenous or subcutaneous Glucose Saline has got to be started immediately and should be repeated till the fluid balance is maintained. Rectal medication in such conditions is useless. For intravenous medication in severe cases even the sinuses in the cranial cavity may have to be selected. But for ordinary purposes saphenous vein in the leg or even ante-cubital vein may be found useful. Bone-marrow is at times selected for this purpose. If I.V. medication is not possible, the subcutaneous route is one of choice. Intra-peritoneal administration sometimes has to be taken recourse to.

(*b*) *Elimination and absorption of the toxins*:—Castor oil, in tea-spoonful doses or in repeated doses in the form of emulsion, helps the process of elimination considerably. It is not at all scientific to stop the diarrhœa all at once, as this is, in fact, a very good safety valve, so far as the elimination of the toxins is concerned. Alternatively the following powder may also be used for the same purpose in repeated doses:—

℞ Calomel Dover's powder	}	āā gr. ½
Sacc. Lact.	...	gr. v

Osmokaolin in 3p doses suspended in glucose water in the form of sips *ad lib*, absorb the toxins in the bowels appreciably.

(*c*) *Specific treatment*:—In infective diarrhœas.—Sulfa drugs like Thalazole or Sulfaguanidine may have to be administered in suitable dosage in infective diarrhœas. Of late, anti-biotics like Streptomycin (orally), Chloromycetin, and Aureomycin have been and are being used with effective result in selected cases when given judiciously.

In dietetic diarrhœas.—Stoppage of the dietetic articles proving to be the cause of diarrhœa and the use of cathartics, are all that is needed. In the allergic group, the avoidance of the Sp. allergens and the use of anti-histaminic drugs and vitamin C sedatives are indicated.

(*d*) *Symptomatic relief*:—For the incessant vomiting and for the pain and restlessness, the following prescription is of great help:

℞ Chloretone	...	gr. ii p
Menthol	...	gr. ¼
Phenobarbitone	...	gr. ½
Ext. Hyoscyamus	...	gr. 1/6
—Gentian	...	qs.

Ft. pill send 8 such.

Sig. One pill stat and every half an hour till the symptoms subside.

3. *Chronic diarrhoeas*:—Here over and above the specific treatment and the symptomatic relief one must take the nutritional œdema, the hypo-proteinæmia and the associated degenerative changes in the liver into account.

Thus, a salt free, high protein diet with an adequate dosage of the essential Amino acids and drugs like Meonine prove very effective within a short time.

The use of green cocoanut water by the I.V. method specially in cases of diarrhœas with nutritional œdema has given gratifying results in the hands of some pædiatricians, possibly owing to its contents of the electrolytes and the essential Amino acids.

The judicious use of iron tonics and the multivitamin preparations (preferably in aqueous solutions) definitely curtail the period of convalescence.

Last but not the least comes the question of feeding the baby.

In acute diarrhœas for the first 24–48 hours, no feed by mouth, excepting 5% glucose drinks (in boiled water) with lemon juice and salt. Then gradually the feeds are to be supplemented with buttermilk, Lactic acid milk, Eledon etc. Gradually fresh fruit juice, milk or malted preparations, boiled eggs are to be added to make the feeds a balanced one.

In chronic diarrhœas with œdema, the elimination of salt is of great importance. In such cases a high protein diet should be given from the very beginning.

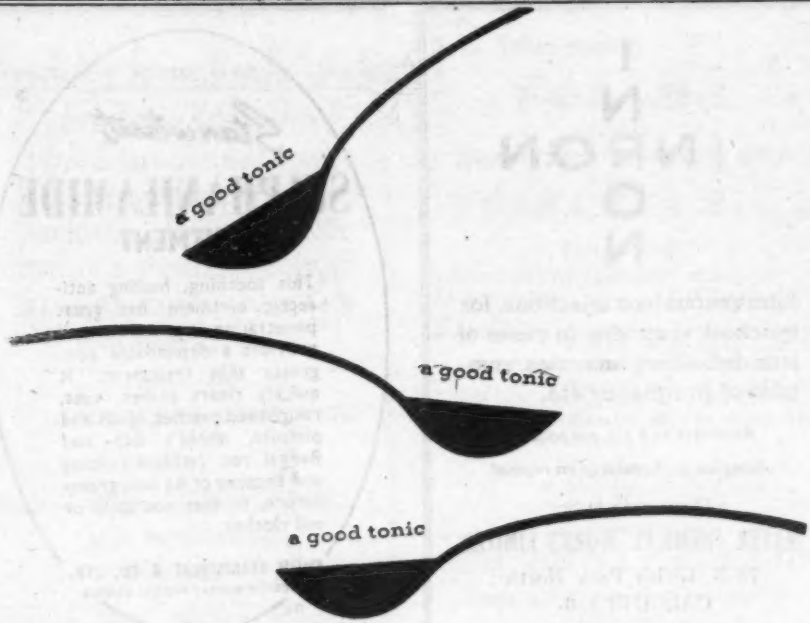
Acknowledgment.—I have great pleasure in expressing my indebtedness to my teacher and my professional senior, Dr. A. B. Mukherji, M.D. (Cal.), M.R.C.P (London), Visiting Physician, Calcutta Medical College, for the very many valuable suggestions that he has kindly made after going through the whole of the article.

References :

Majumdar, N. G.—Journal, Indian Med. Assoc., Vol. xx, No. 6, March '51, p. 212.

Treatment of Whooping Cough with Vitamin C

De Wit reviews the results of a study he made on 90 children. Groups of children of the same ages were given vitamin C by mouth or by injection beginning with a daily dose of 500 mg. (10 tablets of 50 mg. each of ascorbic acid—vitamin C) for 7 days decreasing by 2 tablets (100 mg.) every other day down to 100 mg. (or 2 tablets a day) and continuing at that level until the cure was complete. The average duration of illness was only 14 days in those treated by injection, 20 days in those having it by mouth, and 36 days in comparable cases treated by vaccines. If vitamin C was given in the early stages, it prevented the severe convulsive cough in 80% of cases. Fever complications occurred in children treated with vitamin C than in those having vaccines. The excretion of vitamin C was studied by the author in all these cases at regular intervals, and he recommends that the daily dose of 100 mg. should be continued until 3 days after the entire dose is eliminated in the urine. This stage corresponded to complete clinical recovery.—(*Maandschr. Kindergen. (Eng. Summary)*, 17, 367–74, 1950).



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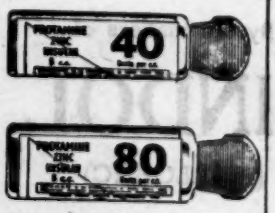

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DIARRHŒA IN CHILDREN

Dr. RAJANINATH R. GHAREKHAN,
District Medical Officer, Mehsana.

I HAVE no approach to a Library or to a Laboratory, and hence I will not discuss the history or the theories of the disease or its various laboratory findings. These are of almost academic interest, and a general practitioner is not much benefited by these. This is a short article which deals mainly with treatment.

The diarrhœa in children is, to a very large extent, seasonal. It is distinctly of two types, one occurring in the summer and the other in the rainy season, and mostly it occurs during the change. Cause in both is different, and hence the treatment also differs.

Diarrhœa occurring in summer.—This is called summer diarrhœa. It actually starts during the change of season from cold to hot. The onset may be gradual but is mostly sudden. The younger the child, the more likely it is to be green, and in infants it is usually green. The green colour is also present when the diarrhoea is associated with broncho-pneumonia. There is hardly any blood or mucous, and slight colic if at all. The child passes the stool almost without its knowledge. The infant cries after the stool is passed. Some colic is present if the stool is green. The frequency may be upto 12 or 15. I am not talking of the so-called choleraic diarrhœa.

The cause is over-activity of the intestines; the food rushing through, before it is digested and absorbed. This over-activity may be due to various causes, which I am not dealing with here. The reaction is usually acid (except when colour is green, when the reaction is alkaline due to bile) and the anus becomes red and raw. The acidity is due to acid fermentation in the instestines. The stomach acidity may be actually low.

About treatment, I shall not deal with elaborate book description hospital treatment, which is largely theoretical, and hardly available even in large, so-to-say well equipped, hospitals, and that too for the mass of people, living in villages, coming on foot from a distance of 5 to 7 miles, and who want medicines for 5 to 7 days at a time.

As is well known opium is a great stand-by, and next are acids. Both these together work much better, so much so that their action may be called synergistic. The action of opium need not be described. Acids work on account of their acidity as well as antiseptic action. In my experience whenever there is a green stool, opium mixed with Ol Ricini in the form of mixture Ol Ricini with Opii is the best. The formula is :—

℞	Ol Ricini	... ℥ ii
	Mucilage Acacia	... q.s.
	Tr. Opii	... ℿ v
	Aqua ad	... ℥ i

Mft. Mixt. (Baroda State Pharmocopoeia)

Dose :—One drachm per year of age three or four times a day is enough. The frequency becomes less and the green colour disappears almost at once, and for this result the mixture need not be repeated for more than 2–3 days. This does not usually stop the diarrhœa because the cause is not removed by this treatment. Then the mixture without opium should be given for a day or two. Now the case becomes a case of simple diarrhœa. For this I use the following mixture :—(Mixture Anti-Diarrhœa).

℞ Liq. Hydrargyri Perchloride Liq. Ferri Perchloride Liq. Morphia Hydrochloride	}	... aa ♏ x
Aqua ad		... ℥ i Mft mist.

I have found this mixture very efficacious, and the child responds extremely well. The dose is usually one drachm for every year upto 3 years, three or four times a day. The diarrhœa stops in a day or two, very rarely it lasts for 4 or 5 days.

Sometimes Acid Phosp. Dil alone acts very well. Sometimes instead of Ferri Perchloride, I use Ext. Bella. Liq. because I feel that the former occasionally causes irritation.

Diarrhoea occurring during the rainy season.—This also occurs mostly during the change of the season, from dry heat to moist heat. The cause, heat, is common in both the types.

Here the attack is usually not sudden. The child cries for a day or two or more previously, the frequency of stools increases and it at first looks like the former type, the difference being that here the child cries almost every time it passes a stool, and it cries even when it does not pass a stool, showing that there is colic. The stools are small and frequent. Usually there is blood and mucous also. Tenesmus is present which is very disturbing to the little patient. Sometimes there is green colour also ; though due to bile, the remote cause is different from that in the first type.

As I said before I am not dealing with the cause, but it is usually germs (bacteria) or worms.

Here opium or acids are of no use. They, on the contrary, are contra-indicated ; the cause being some irritant substance, either a foreign matter or some produced in the bowels, mostly large bowels, and this should be removed. The liver should be made to work, which will sooth the bowels.

This type of diarrhœa may be better called dysentery, and the mixture that I use is therefore called Mist. Anti-Dysentery.

The formula is :—

℞ Sodii Sulphate	... ʒ p
Spt. Ammon. Aromatic	... ♏ x
Tr. Hyoscyami	... ♏ xx
Spt. Chloroform	... ♏ x
Aqua ad	... ℥ i Mft. mixt.

I prefer Spt. Chloroform and Aqua, to Aqua Chloroform. The dose is usually one drachm per year of age upto 3 years and then according to age. To be given 3 or 4 times a day.

I have found this effective. If the frequency is too great Tr. Camphor Co. or Chlorodyne may be added, but is hardly required. No hypnotic is necessary, because the child feels relief very soon. This mixture is not based on the once famous. "Sulphate treatment of dysentery". The above mixture is very useful for dysentery in adults also, improving the condition quickly.

Of course, diet is very important in all diarrhœas. For at least one or two days all food is stopped. Then "Chhas" is the most ideal food—it is almost a medicine. I don't know if there is any correct English equivalent for "Chhas". "Whey", in its English sense is not "Chhas."

"Broken curds" is nearer. The curds from which 'Chhas' is prepared should not be quite "sweet". It is believed that it should not taste acid at all. This is incorrect because it is only sour milk, which is, I believe, irritant, rather than soothing; because it probably contains intermediate products. The 'Chhas' therefore to be effective, should taste slightly acid, and it should be thin. A thick "Chhas" known as "Matha" is harmful. It should be prepared to taste and for this, salt (preferably Sindhav or rock-salt) jira, asafœtida etc., may be usefully added. It should be given in repeated small quantities. Then other liquid food may be given. One has to be more gradual when there is blood and mucus, especially mucus.

I practically never use Bismuth. Somehow I have not found it useful. It may be soothing, and may be forming a protective coat over the irritated mucous membrane, as it is said, but my experience is that mucous remains behind it, under it, and the irritation to the mucous membrane caused by the mucous itself, which should go, continues. Moreover, Bismuth being a heavy salt, forms masses. It probably does not spread like a lime wash on a wall, because of the continuous movement of the intestines. These masses, small or big, themselves cause irritation. Therefore it may be soothing perhaps for a day or two, but are afterwards useless.

It is said that Vitamin A in large doses is sometimes useful. I have no experience, because it is costly and not possible for cases with which I have to deal.

This is not an exhaustive article. I have touched only ordinary diarrhœa and ordinary out-door treatment. That occurring with other condition like rickets, enteric, tuberculosis, malaria, syphilis, worms etc., should be treated along appropriate lines.

I am not in favour of using Sulpha drugs or any such chemicals.

In short, appropriate and judicious use of drugs I have mentioned above give extremely satisfactory results, with very little cost and no risk.

WEANING—EARLY MIXED FEEDING*

S. P. BHATTACHARJEE, M.B. (cal.), D.C.H. (Lond.),
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'WEANING' has been particularly selected as the subject of the present paper, because it is a very important step in the development of children : a step which, in our country, is neglected, overlooked and put aside. There are even controversies regarding the actual meaning of the word. The proper meaning of the word 'to wean' is not to take away from the breast, a sense in which it is commonly used : to wean a child really means to accustom him to something new. Here the word is used to mean mixed feeding.

The ancient law-makers of our country quite understood the importance of the process of weaning. They advised the introduction of vegetables, sweetened rice with milk and other things at the age of six months in a ritual function. The function is observed to the present day, but the advice of those men of yore is followed only on that particular day. In the majority of cases, the people of our country do not give their babies anything else but milk or its substitute as they think that feeding of other things at this very small age would be detrimental to the health of their children. They are over-conscious of the liver of their children and they think that babies cannot tolerate starchy food because, most probably, of the old idea that in young infants the diastatic capacity of the pancreatic juice is still insufficiently developed. The people, however, are not to be blamed for these erroneous notions. A quarter of a century ago these ideas were considered to have a scientific basis ; but with the evolution in the knowledge of pædiatrics these wrong conceptions were rectified. The fact became established that even in the case of the young infant, starch, if not given in excessively large amounts, is well digested. The doctors are of opinion that liver, which has great recuperative power, is an organ that cannot be easily damaged. These new ideas need constant emphasis for a considerable period before they are accepted by the lay people.

For various reasons, the mothers are psychologically quite satisfied in keeping their children on milk only. They are quite prepared to feed their babies half a cup of milk than one cup of vegetable soup, as milk is considered by them to be very nutritious. Moreover, food prepartions, other than milk, means, for the mother, a great deal of botheration. Treatment of this aspect in the psychology of mothers should be tactfully managed by medical practitioners. They should be told emphatically that although milk is undoubtedly very nutritious, it can supply the nutritional requirement of a growing baby only up to a certain stage, after which addition of

* From the Department of Pædiatrics, Medical College, Calcutta.

other food is absolutely essential. Well-to-do parents take pride in declaring that their child, aged one and half or two years, takes one and half or two seers of milk daily ; on the other hand, they complain that the child is not growing normally, is becoming pale and is not playful. These parents are to be tackled in an intelligent way as it is often difficult for medical practitioners to stop them from giving so much milk and to compel them to add other food materials. People of low economic status keep their babies for a long time only on breast milk, which becomes insufficient in quantity as well as in quality as the child grows ; or they add other types of food in a haphazard manner and it produces chronic indigestion. The chronic indigestion, prolonged barley water feeding and insufficient diet produce dystrophy, atrophy or marasmus which is, now-a-days, a great problem in our country.

Weaning—A vitally important step.—The economic condition in our country compels the majority of mothers to keep their babies on breast milk for a long time. There is no harm in prolonged breast feeding, so far as the child is concerned, provided breast milk is sufficient and other types of food containing iron, minerals and vitamins are given. When a healthy baby is 5 or 6 months old and weighs 11 or 12 pounds, he requires 28 to 30 ounces of breast milk in 24 hours to maintain the caloric requirement. It is not practicable to expect a mother to be milched out 30 ounces or more of milk daily. Naturally if the baby is kept on breast milk alone at and after the age of 5 or 6 months, the caloric requirement will not be fulfilled. The caloric requirement might be satisfied by complementing the diet with cow's milk or, in other words, by introducing the so called "Zwiemilchernuhrung" ("double milk feeding"). In that case even, the proper amount of iron, minerals and vitamins will not be supplied. Iron is essential for the proper formation of blood. During the first five or six months of life the baby derives his daily supply of iron largely from its intrauterine store in the liver. So from this age period exogenous supply of iron is essential. Now all milk is poor in iron, so if exclusive milk diet is continued after the 6th month, the baby will naturally develop nutritional anæmia. Better results are obtained by earlier supply of exogenous iron. If small amount of fruit, vegetables and egg yolk are given from the 5th month, the baby will get all the iron he needs and also mineral salts and vitamins necessary for the growth. It may be interesting to note that young animals instinctively choose green iron-containing food at an early age. Man is the only creature that drinks large amount of milk for a longer period.

Babies remain well up to 6–8 months, if fed on only milk—breast or cow's milk or both ; but later on they become pale, do not grow well and become more susceptible to respiratory infections.

It has been noticed that between the ages of 4–10 months babies acquire an inclination to put their hands and other material inside

the mouth. They may be produced by some irritation in the gums resulting from dentition, or in the tongue, or it may be due to something else—an instinctive urge to put something new inside the mouth. He is not gratified with the liquid milk which he gets during his feeding time. He wants something new, and this, not in the liquid form. By putting infected material inside the mouth he produces diarrhœa; and this is the reason why babies get diarrhœa during dentition. It is high time that the association of diarrhœa with dentition should be forsaken. Dentition is a physiological process and it has got nothing to do with any disease entity. It has been noticed that if a healthy child is weaned at the 5th month and be given semi-solid or solid food like vegetable broth, rusk or toast, he is quite satisfied, very seldom gets the bad habit of putting other things inside the mouth and does not get attacks of diarrhœa during dentition.

Parents often complain that their children, although grown up in age, do not eat properly. This capriciousness for food—particularly solid food—is not due to any physical illness. These children, without any obvious illness, refuse to eat any solid food or they eat a small amount at a time, or eat too slowly and dwandle over their food. Naturally, the physical growth is hampered and they become a problem. Parents often console themselves by the delusion that the holes in the throats of these children are too small for the passage of the swallowed material. The case history of these children would, however, reveal that in most of the cases weaning was not started at the proper time. If the child is not accustomed to solid feeding in a gradual process, if he is not taught to chew properly and to swallow, it is quite natural that he will refuse solid food. The process of eating is an art, and this is to be practised in a gradual degree. It is very unfair to think that one fine morning parents will be able to find that their children are chewing and swallowing solid food. Sometimes the case is more complicated with the advent of negativism—a psychological disturbance in the child. This is produced by the parents and near relatives who begin to fuss with the feeding of the child. The child is made to occupy the centre of attention in the home. The scene is rendered as dramatic as possible by constant admonitions, instructions, warnings, threats, coaxing, punishing, bribing, cajoling and others. The child, in turn, whines, screams, fights and behaves unmannerly. In all such cases the inherent fault lies with the parents, who do not wean the child at the proper time or where the weaning process is not properly steered.

These considerations justify the conclusion that weaning is vitally important in the rearing up of children.

The right time of weaning.—The weaning should be started in the 5th or 6th month when the weight of the child is 12 pounds. The process is to be followed very gradually, as tiny babies may

become upset if many new types of food are started at the same time or in quick succession. The process should extend for at least three months and during these three months the baby is to be accustomed to new items of food gradually. The process should not be started in hot summer months as during this period gastro-intestinal upsets are common in babies. It is better to begin earlier if it is expected that the proper time of weaning will fall in very hot weather. Incidentally, it may be mentioned that the American schools let the baby to be nursed as long as the mother has serviceable supply of milk but they make sure that the baby gets enough food, whether from the breast alone or in combination with other material. Almost from the beginning they supplement the breast-feeding with special food rich in vitamins and little later with food rich in minerals.

Technique of weaning.—In a practical sense the problem of weaning is to search for the best of all possible correlations and to derive a method from it. Babies are individuals not alone in their pathologic but also in what may be assumed as their normal attitude to food. For this reason it seems desirable in a practical discussion to omit all tables of feeding schedules and to reduce all figures to a flexible minimum. In the preparation of a diet, care must also be taken to limit it to the foodstuff that is easily available. A very important point to be remembered is that weaning should never be started when the baby is not feeling well.

Here the discussion is restricted to an ideal case where a healthy baby of 5 months old is wholly breast-fed and gets the milk five times a day at 6 a.m., 10 a.m., 2 p.m., 6 p.m., and 10 p.m.

The first addition to make is fruit juice and raw fruit pulp. These should be given fresh and ripe and should never be cooked. Oranges, musambis, tomatoes, bananas, papayas and apples may all be given. The fruit is to be washed well, passed through a sieve, sweetened with a little cane sugar and given from a spoon immediately before 10 a.m. feed. At first the fruit juice should be given in small amount (½—1 teaspoon) and gradually the amount is to be increased to 8—12 teaspoons a day. Following the fruit juice the baby is to be put to the breast as usual after allowing the baby to 'break the wind up', by making him sit up and patting on the back. Of course the time of breast-feeding is to be gradually diminished as the quantity of fruit juice is increased. Usually healthy babies tolerate the fruit juice if it is started in small amount and increased gradually with the tolerance of the baby.

At the age of 5½ to 6 months, the next addition is to be made with vegetable soup before the 2 p.m. feed. 1 or 2 carrots, ½ potato, ½ green plantain, ½ or 1 onion are washed, cut into pieces and cooked in slow fire till soft, in just enough water to cover them. Then they are to be passed through a sieve and replaced in a saucepan with 2—4 ounces of cow's milk and little salt. It is better to thicken the soup with little flour (½ to 1 teaspoon). Cane sugar may also be

added to the soup if the baby likes sweetened feed. To start with, one teaspoon is to be given and gradually the amount increased according to the tolerance of the baby till the whole breast-feeding is supplemented with the soup. As the child grows older, the amount of vegetables is to be increased, fish is to be added and the soup thickened by mashing the vegetables.

With the cutting of teeth, rusk or biscuit or toast can be given and little soft rice mixed with soup is to be added before the vegetable soup at 2 p.m.

The next addition is to be made with cereal water at 6 a.m. feed. Rice is the most easily available cereal in our country. Rice, thoroughly washed with water, is to be dried in the Sun, and then powdered and stocked in a bottle. In 8 ounces of water one level teaspoon of powdered rice is to be added and made to boil till the water is halved. To begin with, one teaspoon of rice water is to be given and gradually the amount increased to 2 ounces. Following the rice water the baby is to be put to breast as usual. In a similar way rice water is to be added gradually at 6 p.m. feed, in addition to breast milk.

Difficulty arises with many babies, when egg yolk is added. If gastro-intestinal upset does not occur and if allergic skin manifestations are not noticed, the amount of egg yolk is to be gradually increased up to the yolk of one egg. Egg yolk, if tolerated, is to be given two days a week in the early morning feed.

As the child grows older, the time of feedings should be gradually altered and the number diminished to four (7 a.m., 11-30 to 12 noon, 4 p.m. and 8-30 p.m.).

With the diminution of the amount of breast milk, cow's milk should be gradually supplemented and given mixed with cereal water and cane sugar. In those cases where breast milk is not sufficient from the beginning, cow's milk mixture with water or cereal water, in the dilution of 1 : 1 or 2 : 1 according to age and tolerance, is to be given. As conditions exist in our country, with the adulteration of cow's milk by dirty polluted water and other material, preference should be given to powdered milk available in the market. Care must be taken to see that the powdered milk is genuine and properly sealed.

The detailed time table of mixed feeding may be different in each individual case, but the above mentioned routine has been found to be quite convenient. If during weaning the child becomes ill, the process cannot be proceeded with. As the child gets well and leads his normal life, the mixed feeding is again to be started right from the beginning. But this time the process is to be followed with a little rapid succession.

In conclusion, to give more emphasis, it is again stated that "weaning", which should be considered as a vitally important process in child's life, is to be started at the proper time and under proper guidance. In no case the completely weaned child should get more than 20 ounces of milk a day.

I am indebted to Dr. D. C. Chakravarty, Principal, Medical College, and Dr. K. C. Chaudhuri, Chief Physician, Department of Pædiatrics, for permission to publish the article and for valuable suggestions.

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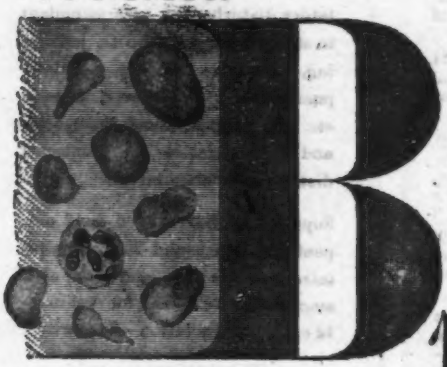

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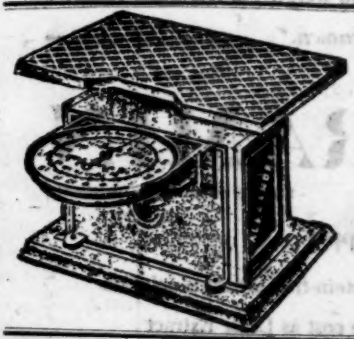

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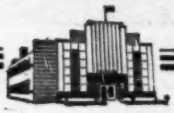

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Potassium Bromide	80 grs.
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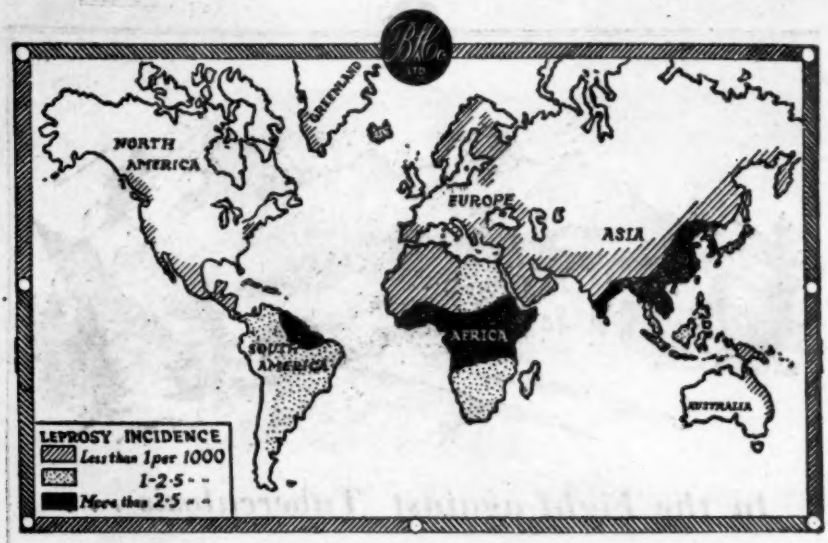

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AIX 55

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Terramycin

HYDROCHLORIDE

RESULTS OF TERRAMYCIN THERAPY IN 62 CHILDREN*

NO. OF CHILDREN	DIAGNOSIS	NO. WITH GOOD RESPONSE	NO. WITH NO RESPONSE
14	Lobar pneumonia	14	0
31	Bronchopneumonia	31	0
8	Otitis media	6	2
1	Tonsillitis	1	0
1	Sinusitis	1	0
2	Infectious hepatitis	0	2
1	Exanthem subitum	0	1
1	Measles	0	1
1	Typhoid fever	0	1
1	Laryngo-tracheo-bronchitis	1	0
1	Gonorrheal vaginitis	0	1

*Potterfield, T. G., and Starkweather, G. A.: J. Philadelphia Hosp. 2:6 (Jan.) 1951.

Terramycin is available in **CAPSULES**, 250 mg., bottles of 16 and 100; 100 mg., bottles of 25 and 100; 50 mg., bottles of 25 and 100.
ELIXIR (formerly Terrabon), 1.5 Gm. with 1 fl. oz. of diluent.
ORAL DROPS, 2.0 Gm. with 10 cc. of diluent, and calibrated dropper.
INTRAVENOUS, 10 cc. vial, 250 mg.; 20 cc. vial, 500 mg.
OINTMENT, 30 mg. per Gm. ointment; tubes of 1 oz.
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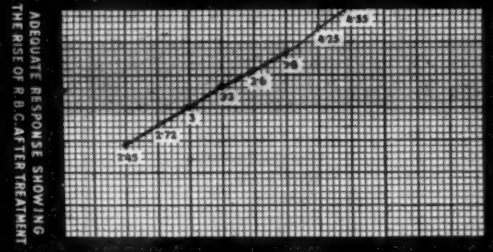
CIPALON

PROTEOLYSED WHOLE LIVER EXTRACT

ADEQUATE RESPONSE



BLOOD EXAMINATION:

In all cases of anæmia it is advisable to do blood examinations before commencing the treatment and again after a fortnight, to watch the progress of the patient. This will also give a clinical proof of the adequate response produced by CIPALON within the prescribed time.

INDICATIONS:

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DOSAGE:

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Granules and tablets.
Tins of 100 gms. granular 66% P.A.S.
Bottles of 1000 and 100 tablets 0.5 gm.

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Tablets of 10 microgram.

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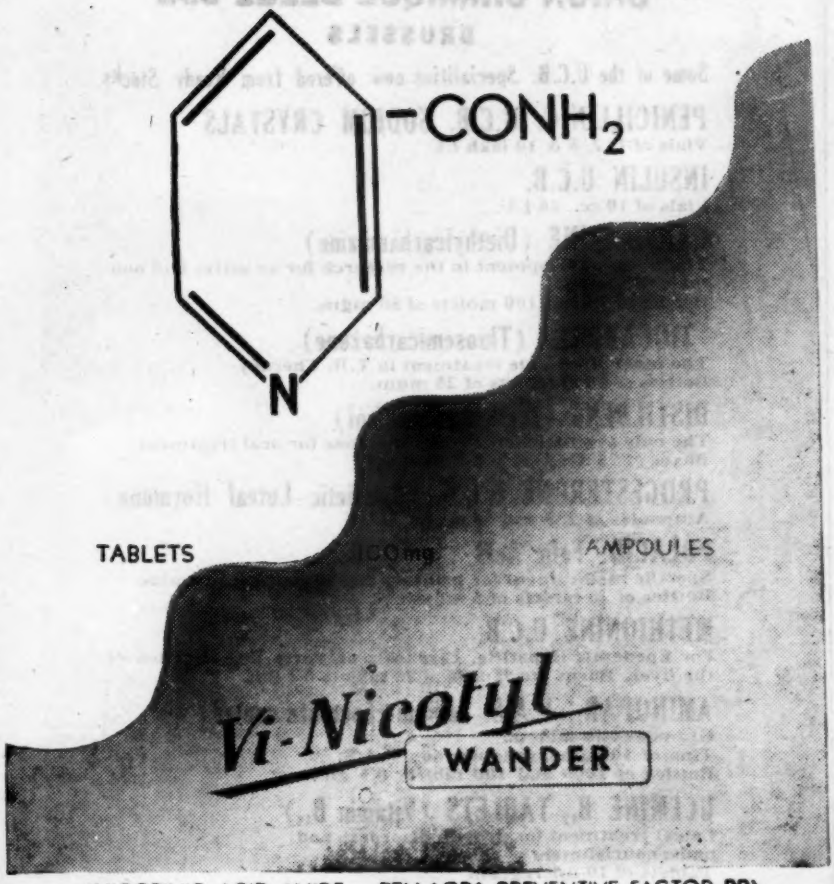

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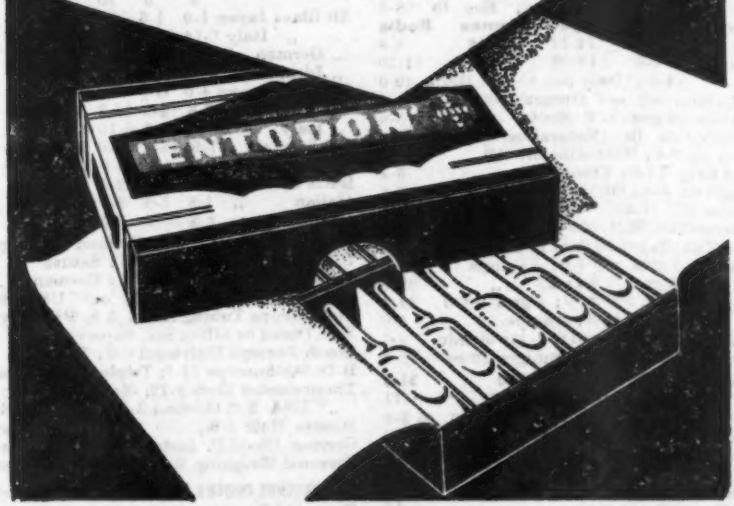

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„ Lilly 4-0; Cheap 3-4

Penicillin G. Sodium or Potassium:

	1	2	5	10 lacs.
Pfizer	0-15	1-0	1-12	2-12
Merck	0-14	0-15	1-10	2-10

Procain Penicillin 3 lacs x 10 cc. Merck, Pfizer
Aquas Merk „ 4 x 1 cc. 3-6 [10-8; 11-8
Penicillin Eye Oint. 8-8; Skin 14-0; Lozengis
Procain Penicillin 20 lacs 8-12 Merck [doz. 14-0
Aureomycin 8 Caps. 25-8
Chloromycetin Caps. 12 28-12
Quinine Bengal or Madras 49-0; Stand lb. 45-0
„ Sulph. Roche 80-0; Java 62-0; Howds 75-0
„ oz. Ind. 4-0; Howds 6-4; Bihydro oz. 8-8
Quinine Bihydro Amps. 10 grs. x 2cc. x 100

Ind.	P.C.	B.D.H.	Evans	B.W.	P.D.
20-0	32-0	31-8	31-8	43-0	55-0

Quinine Amps. Italy 15grs.x2 cc. x 5 1-12; 100 30-0
„ Bihydro 2gr. x 100 4-4; Howds 5gr. 9-0
„ Bisulph 2 gr. x 100 3-8; 5 gr. B.W. 7-0
„ „ 5 gr. x 1400 Howards 85-0; 1000 75-0
„ „ 5 gr. x 1000 BDH. 46-0
„ Sulph. 3½ gr. x 500 Java 20-0
Eue Quinine Holland 5-12; Java 5-12; Roche 7-8
P.A.S. Herts 250 grms. 34-0; Eng. lb. 28-0

100 grms.	Italy	Bayer	Dumex	Rodia
	6-4	12-12	14-12	8-8
100 Tabs.	6-0	11-10	—	11-10

250 „ 14-0; Italy 500 25-0; Herts 49-0
Pamaquinine tab. any strength 300 1-4
Acriflavine 25 grm. L.P. Boots 5-0
Soda Salicylas lb. (Natural oz. 3/4) 8-0
Menthol oz. 6-0; Santonine dr. MB. 10-8
Argyrol Orig. 17-0; France 5-0 5-4
Protargol oz. 6-0; Oil Chinopodium 7-8
Mepacrine ICI 11-8; Quinacrine 1000 8-12
Quinacrine Tab. M.B. 500 6-8; 1000 11-0
Atebrin Tab. Bayer 15 doz. 10-8; 300 10-8
„ Amps. 1 grm. x 5 4-0; 50 amps. 35-0
„ „ 0-3 gr. x 5 8-4; 25 „ 27-0
Paludrin 3 grms. 500 26-0; 1 grm. 1000 29-8
„ amps. 25 11-8; 5 amps. 4-0
Vitamin B_{12} amps. Glaxo 6, 4-12; 50 mic. 9-0
Rubramin amps. 16-0; Berubigen 10 cc. 12-8
M.B. 693 500 40-8; M.B. 760 500 31-0
N.A.B 15 1-2; ·3 1-5; ·45 1-8; ·6 1-11
Neosalvarsan ·15 1-15; ·3 2-12; ·45 2-13, ·6 3-8
Sulfarsinol 1 1-1; 2 1-4; 3 1-7; 4 1-10
Acetylarson adult 8-8; Child box 5-4
Neptal 6 x 1cc. 3-4; 6 x 2cc. 4-0
Emetin Hydro Endo 6x½ gr. USA. 2-8
„ BW. ½x12 8-12; 6x1gr. 8-12
„ „ ½ gr.x100 65-0 1 gr. x 100 BDH 100-0
„ PD ½ gr. x 6, 7-8; 6x1 gr. 9-12
Cibazol tab. 250 17-12; Sulphatriad 100 10-0
Enterovioform 20 2-14; 100 11-4
Berin 25 mg. 2-8; 50 mg. 4-4; 100 mg. 6-8
Sulphanilamide tab. Eng. 7½ gr. 10-0; 5gr. 7-4
„ MB 500 7-0; Glaxo 1000 15-0; Powder oz 1-8
Sulphaguanadine Aust. or Eng. 1000 32-0
„ 500 Eng. 16-8; M.B. 22-0; BW 17-0
Sulphadiazine Tabs. Eng. 1000 90-0; MB 500
Sulphathiazole Boots 1000 50-0; [60-0
ICI. Sulphamerathine 100 7-0; 500 32-0
Yeast Tab. B.D.H. 1000 7-4; Eng. 6-8
Liver Ext. 2 USP. 4-11; 5 USP. 9-8; Combex
BW. Sulphetrone 100 13-4; 500 55-0 [10 cc. 7-2
Sandoz Cal. 10% x 10cc. x 5, 6-8; 20 amp. 23-0
„ „ „ 5cc. x 10 10-12; 100 98-0
Ind. Cal. Glu. 10%x10cc. x 100 18-0; 5cc 16-0
Redoxon 6x2cc. 7-0; 3x5cc. 6-8; 25x5cc. 48-12
„ 50x2cc. 59-0; Tab. 20, 2-4; 250, 26-0
Gylotropin IV, IM 5-0; Atophynal IM, IV 10-8
Ephedrin Tab. ¼gr.x1000 Ind. 12-8; Eng. 15-12
Saridon Tab. 10 19-8 doz 250 34-0; Thymol oz.
Sulphanilamide Cream 4 oz. 7-8; doz. Lilly [5-0
Vitamin B_1 Tab. 500 USA, 1-8; Vitamin Compd.
Nicotinic Acid 500 Eng. 4-8 [USA. 500 5-0
Potas Chloras tab. 500 6-0; Powd. lb. 4-0
Omnopon Amps. with Needles Comp. Tabs 1-0
Haemocytoserum 10-0; Campolan 6x2cc. 6-8
Entodan amps. 11-8; Feradol 11 lb. 8-0
Metatone 12 oz. 7-0; Gentian Violet Jelly doz.
Platues Folic doz. 80-0; Liver 45-0 [7-0

Hypo. Syringe (S.N. Re. one more) S.N.

	2	5	10	20	30	50cc.
All Glass Japan	1-0	1-6	2-2	3-8	6-4	7-8
„ „ Italy	1-14	2-14	3-14	6-8	9-0	11-8
„ German	1-8	2-0	3-0	4-8	8-0	10-8
„ Ideal	5-12	7-8	10-0	11-8	18-8	25-0
Record German	4-0	6-0	7-4	10-4	15-8	23-0
„ Comp. Ger.	7-8	9-0	11-8	—	—	—
„ Italy	3-12	5-8	6-10	8-12	12-0	17-8
B.D. Luer Lock	7-8	12-0	14-0	17-0	22-8	32-8
Japan „	3-0	4-0	5-4	8-4	10-12	17-0
Indian Metal case	1-4	1-12	2-4	3-0	5-12	5-12
Italian „ „	1-8	2-4	3-0	4-0	—	—
Backelite case	1-8	2-12	3-0	3-0	—	—

Record Needle D.B. 4-8; German 2-12; Japan 2-8
U.S.A. 5-8; B.D. doz. 10-8; Sature 4-0
All Glass Mount, Japan 3-4; German 4-0
Rubber Gloves Superior 7½"or8" USA. dz. 12-0
Stethuscope Tubing Latex 3-8; Plastic yrd 2-4
F.L. Durex or Silver tex. Superior 2-8
Tooth Forceps Universal 5-0; U.S A. 8-8
B.D. Stethuscope 21-8; Triple 34-0; German 11-0
Thermameter Hick 4-12; Zeal. 3-4; Eng. 2-0
„ USA. 2-0; German 2-0; Japan 1-8; BD. 8-8
Hoarse Hair 2-0. Baumonometer 125-0
German Blood P. Instruments Erkameter 70-0
Personal Weighing Machine U.S.A. Detecto 45-0
STETHESCOPE POUCHE PLASTIC each 6-8
First Aid Box 10-8; Aletris 13-8
Wampole Phospho 17-0; Waterburys Red. 6-8
Distil Water 5cc. x 100 7-0; 10cc. 8-8
Penicillin Tab ¼ lac. 3-8; 1 lac. x 12 tab. 6-12
Saline Apparatus 300cc. 9-0; 500 cc. 11-8
Fountain pen Battery 4-0; GripeWater dz. 37-8
Dispensing Scale Brass 4-4; Nickle 5-12
Glycerine Syringe Metal 1 oz 5-12; 2 oz. 6-12
Sterilizer 6" 15-0; 8" 23-0; Asparine 1000 7-0
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T. C. F. less 10%. Indon Products 15% less.

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For the first time in India we introduce **UCEMINE B_{12} TABLETS** containing each 10 microgram of **VITAMIN B_{12}.**

This Vitamin, which is reputed all over the world for its haematopoietic properties in macrocytic anæmia and its curative power in nervous disturbance due to Biermer's disease, has recently proved an excellent growth factor in children.

In a series of tests performed on under-grown children, it proved that when given orally in the proportion of a few micrograms (1/1000 mgm.) it increased the effects obtained by a well-balanced diet, an open-air life and a rational hygiene. In addition, it caused a rapid resumption of growth in children who did not respond to conventional measures; all the children treated became more alert, more active and their appetite increased whilst their general behaviour improved appreciably.

UCEMINE B_{12} in tablets is especially intended for treatment of growth disorders in children.

POSOLOGY: 1 or 2 tablets of 10 micrograms of Vitamin B_{12} per diem for several weeks, taken with a glass of milk, or at meal times.

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„ „ 0·1 gm. 1 „ 0-12; 50 amps. box 28-8
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Quinacrin U.S.A. 100 1-0; 1000 „ U.S.A. bot. 9-0
„ M.&B. 500 6-8; 1000 tab. tin 11-4
Paludrin 3gm. 8 tab. 7-6; 500 tab. 3gm. „ 26-4
„ 2c.c. 5 amps. 3-4; 25 amps. box 11-4
Pamaquin 0·01 gr. 500 tabs. bot. 1-2
„ 0·02 „ 300 tab. „ 1-2
Sulphagunadine 500 tab, Boots or Eng. tin 17-0
„ Australia 1000 34-8; 10000 „ „ 340-0
Sulphadiazine 25 2-14; 100 tabs. „ 11-8
„ 500 52-0; 1000 tab. bot. 93-0
Sulphanilamide U.S.A. 5gr. 1000 tab. „ 7-8
„ Eng. 7½ gr. 1000 13-8; 500 „ „ 6-12
„ M.&B. 500 6-12; Glaxo 1000 tab. tin 15-8
Sulphathiazole Boots 500 tabs. „ 26-8
Euquinine Holl. or Java 6-0; Roche oz. 7-4
Eng. Vitamin B_1 25 0-9; 100 tabs. bot. 1-2
„ „ „ 500 5-12; 1000 tabs. „ 10-8
Listerine Liquid Small doz. 33-8
Waterbury's Compound large „ 66-0
P.D. U.S.A. Ferradol 2½ lb. bot. 15-8
Quinine Sulph Govt. B.P. 51-0; Std. lb. 43-8
„ „ Roche 79-0; Java 70-0; How „ 73-0
„ „ Ind. 4-0; How 6-0; Bihydro oz. 8-12
„ Bisulph 2 gr. 100 3-0; 5 gr. 100 tab. 7-12
„ „ 5 gr. 1400 90-0; 1000 tab. How bot. 75-0
„ „ 5 gr. 1000 tab. B.D.H. „ 47-8
„ Bihydro How 2 gr. 100 „ 4-4
„ „ „ 5 gr. 100 tab. „ 9-0
„ „ Italy 15 gr. 2c.c. 5 amps. box 1-4
„ „ B.W. 10 gr. 12x2 c.c. 5-4; Evans „ 5-0
„ „ 10 gr. 2cc. 50 amps. Ind. „ 9-12
„ „ 5 gr. 1cc, 6 amps. B.D.H. „ 1-14
„ „ 5 gr. 1cc. 100 „ „ „ 25-8
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„ Coramine Liq. 15c.c. 3-14; 20 tabs. „ 3-0
„ „ 1.7c.c. 5 amps 2-12 20 amps 10-8
„ Enterovioform 20 2-14; 100 tabs bot. 12-4
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„ Mercury Biniodide 12 x 1cc. box 0-10
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Eye Dropper USA type 0-5 Finger Stall doz. 1-0
Elastoplast 2½x5 yds. 2-0; 3x5 yds. tin 2-4
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„ Aspirin 5x100 0-14; 1000 „ „ 9-0
„ „ Caffein 100 2-4; 1000 „ „ 14-8
Easton Syrup ½dr. 100 2-8; 1000 tab. bot. 21-0
Laxative Vegetable 100 2-0; 1000 „ „ 14-0
Nicotannic Acid 0·5gm. 100 1-4 500 „ tin. 4-8
Sodamint 100 0-14; 1000 „ „ 2-8
Yeast 100 tabs. 1-0; 1000 bot. 6-8
Eng. ProcainHydrochloride 1% 3cc. 25 „ „ 4-8
Glaxo's Adexolin Liq. 14 cc. 2-0; 100 caps „ 6-0
„ Berin 1mg. 25 tabs. 0-9; 100 tabs. 1-2
„ „ 1 mg. 500 „ 5-8; 1000 „ „ 10-12
„ „ 50 mg. 10c.c. 4-0; 100 mg. ea. 6-8
„ Fersolate 100 1-10; Codopyrin 10tab. 0-12
„ Erbolin 10 tab. 1-4; 100 tabs. bot. 5-4
„ Celin 6 x 1cc. 4-14; Berin 25 mg. 10cc. 2-8
„ Celin 50 mg. 25 tabs. 1-10; 100 tabs. 3-12
Hypo Record Needle Japan 3-0; Italy doz. 3-0
„ „ „ German 3-0; Down „ 4-12
„ All Glass „ Japan 3-8; German „ 4-0
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	2c.c.	5c.c.	10c c.	20c.c.	30c.c.	50c.c.	
C.N. :—							
German	1-2	1-12	2-12	4-0	8-0	10-8	B
Italy	1-10	2-10	3-8	5-8	8-8	11-0	c
Japan	1-0	1-8	2-8	3-8	6-12	8-12	h

S N.—Re. 1-0 More
Hypo. Syringe All Glass in Metal case with 2 Needles :—C.N.:—
2cc. Japan 3-8; German 3-12; Italy 4-0 each
5 cc. Japan 4-14; German 5-4; Italy 5-8 „
Hypo. Syringe Leur Lock Nacket :—

B.D. (C.N.)	2c.c.	5c.c.	10c.c.	20c.c.	30c.c.	50c.c.
	7-10	12-4	14-0	16-8	25-8	32-0
Ideal (C.N.)	7-4	10-0	13-0	15-8	21-8	30-8

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Litmus Paper Book Assor „ 1-0
Leukoplast Elastic 3x5 yds. 2-0; 2½x5 tin 1-12
Lilly's Gentian Violet Jelly 4 oz. Tube. 1-0
„ Sulphanilamide Cream 4 oz „ 0-10
„ Lextron Ferrous 84 caps. bot. 18-0
M. & B 693, 100 tabs. 9-0; 500 tabs. tin 42-0
„ Neptal 6 x 1cc. 2-8; 6 x 2 cc. box 3-14
„ Sulphatriad 25 2-4; 100 tabs. bot. 9-0
„ Propamidine Jelly 1 lb. bot. 9-10
„ N.A.B. 15 1-2; 3 1-5; 45 1-8. 6gm. ea. 1-11
P.D. Chloromycetin 12 Caps. bot. 29-12
„ Benadryl 50 cap. 6-0; Combex 10 cc. 6-12
„ Camoquin 3 tabs 1-15; Metatone 6-14
„ Benadryl Syrup 4 ozs. bot. 3-14
„ Dinaltin Sodium 100 caps bot. 6-0
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P.A.S. Italy 250 tabs 14-0; Italy 100 bot. „ 6-0
„ Italy 100 gm. 6-4; 250 gms. tin 17-8
Rubber Gloves "7½" or "8" USA per pair 1-4
Scissors "5" 2-0; Scalpel "5" each 1-12
Suture Needles 0-4 Saline Needle each 1-14
Saline Apparatus 300 cc. 7-0; 500 c.c. „ 10-0
Menthol Crystal 1oz. oz. 6-0; Speeton tabs. 1-14
Urodonal 49-8; Sindol Pow. doz. 13-8
Gynomin tabs. 22-8; Dexrosol 1 lb. „ 25-8
M&B Thiazamide 100 7-0; 500 tabs. tin 29-8
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1 lac. 0-14; 2 lac. 0-15; 5 lac. 1-10; 10 lac. 2-12 each

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Also useful in
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Successfully achieved with

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STANDARDIZED EXTRACT OF RAUWOLFIA SERPENTINA

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Lymphogranuloma venereum
Measles
Mumps
Paratyphoid fever
Pertussis
Primary atypical (virus) pneumonia
Prostatitis
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Urinary tract infections

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